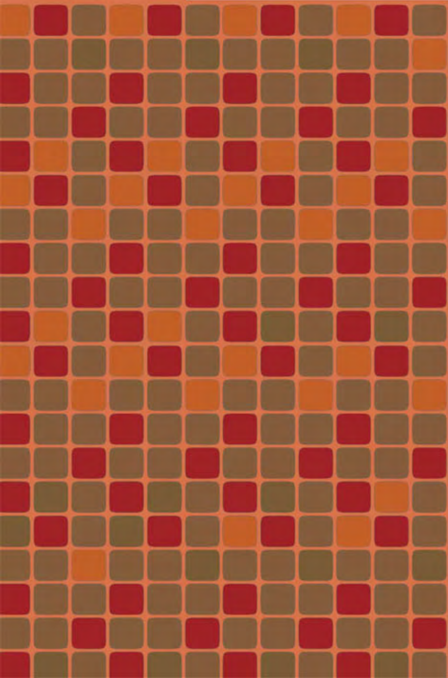
Aquatic and Wetland Plants of Southeastern United States

Monocotyledons

Robert K. Godfrey
and Jean W. Wooten



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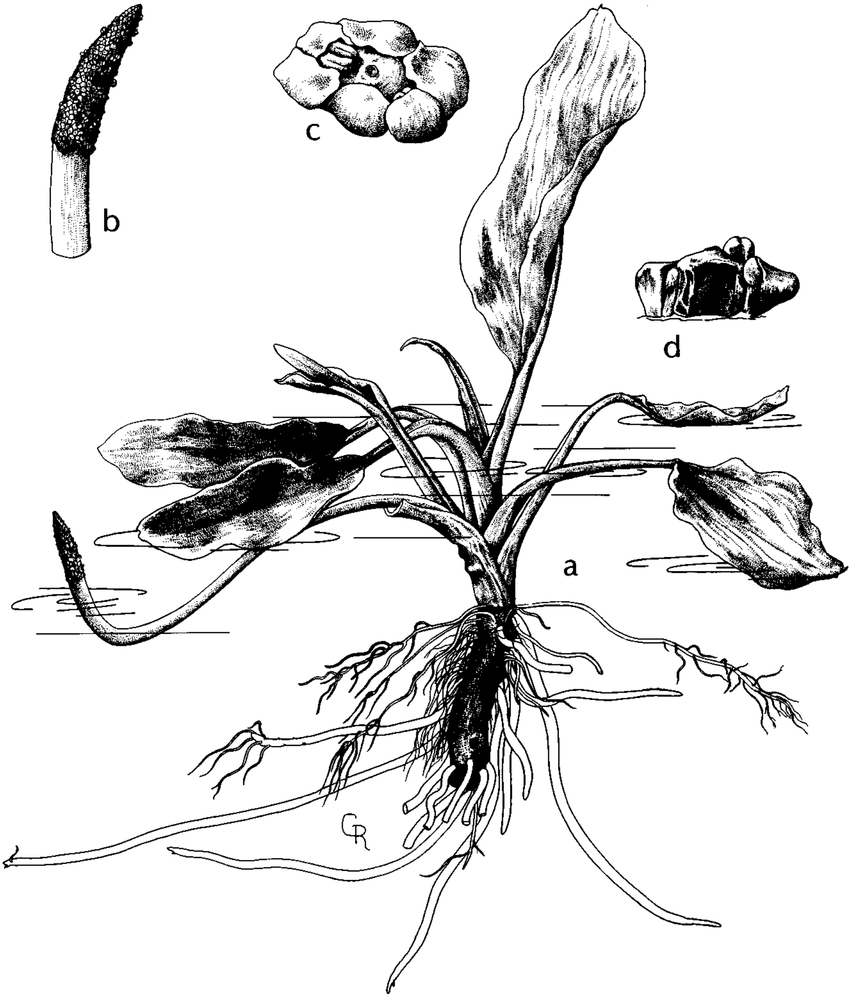

Frontispiece. **Orontium aquaticum:** a, habit; b, spadix; c, flower from lower part of spadix, face view; d, side view, partially dissected flower.

AQUATIC AND WETLAND PLANTS OF SOUTHEASTERN UNITED STATES

MONOCOTYLEDONS

Robert K. Godfrey
Jean W. Wooten

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TO
BERTRAM WHITTIER WELLS

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Preface

This work was initiated in a limited way about twenty years ago by the senior author with a grant from the National Science Foundation for study of aquatic plants in Florida. Subsequently, funding was obtained from the Institute of General Sciences, National Institutes of Health. During the several years those grants were in force, efforts were given to field exploration, collecting of voucher specimens, preparation of illustrations, and to preliminary drafts of keys and descriptions for some families and genera.

From 1963 to 1973 the senior author's departmental duties changed in such a way that research on the project languished. During that ten-year period, Dr. Donovan S. Correll and Dr. Helen B. Correll, then of the Texas Research Foundation, commenced and saw to fruition their comprehensive book, *Aquatic and Wetland Plants of Southwestern United States,* first published in 1972 by the U.S. Environmental Protection Agency and reprinted (in two volumes) in 1975 by the Stanford University Press. While the Corrells were engaged in research leading to that publication, we offered them the opportunity to use whatever illustrations we had which were appropriate to their work. They did indeed use a large number of these illustrations, and a little salve was thus applied to the senior author's conscience.

Upon his retirement from Florida State University and then chiefly under the auspices of Tall Timbers Research, Inc., the senior author reactivated research on aquatic and wetland plants. Dr. Wooten, then temporarily in residence at Tallahassee, particularly encouraged renewal of the effort, and her collaboration in it was agreed upon. At that time it was decided to expand the geographic area of coverage to include a block of states of the southeastern United States that would juxtapose against the eastern boundary of that area incorporated in the Correll's project, namely, North Carolina, South Carolina, Georgia, Florida, Tennessee, Alabama, Mississippi, Arkansas, and Louisiana.

Gratitude is hereby expressed for the following grants from federal agencies which supported the basic early stages of the work: NSF G–4321 and Division of General Medical Sciences, National Institutes of Health, U.S. Public Health Service RG–6305.

Artists who drew nearly all of the illustrations done under our supervision are Mr. Grady W. Reinert and Ms. Barbara N. Culbertson. Their participation is remembered with much pleasure, no little appreciation, and a full measure of admiration for their talents. We extend our thanks also to Ms. Melanie Darst who prepared a few illustrations during the final stages of collation of illustrative materials. Gratefully we acknowledge the privilege of using plates from Clyde Reed's *Selected Weeds of the United States* (1970) and illustrations from Hitchcock and Chase's *Grasses of the United States* (1951). The editor of the *Journal of the Elisha Mitchell Scientific Society* kindly agreed to our use (slightly modified) of plates from the paper on *Smilax* by the late Professor W. C. Coker (1944). To Robert Kral, Dr. John W. Thieret, and to Dr. Robert E. Haynes and Mr. Alan Wentz go our thanks for use of plates from their published works. We thank Dr. Carroll E. Wood, Jr. who made available three plates from Wilson (1960) in the *Journal of Arnold Arboretum.* We express our sincere gratitude to the Drs. Correll for their very considerable encouragement, advice on technical matters, for use of drawings prepared for their book by Vivien Frazier, and for use of orchid plates.

Over the years persons who were at one time or another graduate students in botany at Florida State University gave valuable assistance, both directly and indirectly, some of it fruits of their labors, more particularly enrichment to life. These include Robert Kral, William D. Reese, Ronald W. Pursell, Paul W. Redfearn, Jr., Luis Almodovar, Ronald Phillips, Grady W. Reinert, Albert Latina, Norlan C. Henderson, Richard S. Mitchell, H. Larry Stripling, Richard D. Houk, William F. Fryar, Sidney McDaniel, and Victoria I. Sullivan.

No small measure of credit is due, and is given with appreciation, to the Tall Timbers Research for aid of staff and services, for use of facilities, and for the stimulative interest of the Director, Dr. Edwin V. Komarek, Sr., who has shown the senior author every personal and professional courtesy and has provided the freedom to work without imposing extraneous interruptions.

Contributions of parts of this work by Dr. Donovan S. Correll, Dr. Robert Kral, and Mr. Howard L. Clark are acknowledged with much gratitude.

During the last several years, we have enjoyed on numerous occasions a pleasurable and profitable association in field work with a highly skilled amateur botanist, Mr. Angus Gholson, U.S. Army Corps of Engineers, Resource Manager for Lake Seminole, Chattahoochee, Florida.

Close friends (and some not so close) know to what extent Mrs. Godfrey's dignity and patience have been stretched taut and thin by her husband's professional preoccupations, not to mention his general idiosyncratic behavior. Her indulgences do not go unappreciated.

In preparation of this work, judicious use has been made of a great deal of information in published works of botanical colleagues: taxonomic revisions, manuals and floras, floristic studies. Availability of these publications has helped greatly to make the task practicable, and this is gratefully acknowledged.

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AQUATIC AND WETLAND PLANTS OF SOUTHEASTERN UNITED STATES

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Introduction

The aim of this work is to aid in identifying native and naturalized monocotyledonous plants that inhabit aquatic and wetland places, places permanently or seasonally wet. It is not intended to be a study of ecology of hydrophytes. It is hoped that, as a taxonomic-floristic work, it will have value to ecologists, to agents of governmental agencies concerned one way or another with environmental problems, to contractual firms engaged in environmental impact analyses, to individuals with general ecological interests, and to students in colleges and universities. Recognizing that these prospective users will have had diverse or limited experience in plant identification, we have sought to use, whenever possible, nontechnical language. We trust that we may have achieved this goal to a limited but useful extent. A glossary is included to help with the technical terminology without which it is impossible to describe features necessary for reasonable understanding.

It is intended that this volume will be followed by another treating dicotyledonous plants. Initially we did not plan to have research on the two groups of flowering plants published separately. However, as the endeavor proceeded, the magnitude of the task and the consequent anticipated time period necessary to accomplish the whole rather overwhelmed us. Moreover, we were encouraged, especially by persons in governmental agencies in the local area, to make even a part available as soon as practicable. We then decided to restrict ourselves to monocotyledons and to have this work published separately. Meanwhile, the treatment of dicotyledons is being prepared.

Those of the southeastern United States for which this manual affords botanical coverage (see preface) encompass parts of the following physiographic provinces: Atlantic and Gulf coastal plains, southern Appalachian highlands, flanked on the east by the Piedmont plateau, and on the west by the Appalachian plateau, the interior lowlands, and the interior highlands. The region has a diverse topography, a wide range of habitat types, varied and variable organismal communities, thus diverse ecosystems. In many instances our ecosystems, complex and not readily delimited to begin with, are becoming increasingly "blurred" and degraded both by man's overt direct manipulation and by the vicissitudinous alterations attendant upon one or another of his activities.

FORMAT

The text for each species includes a statement indicating the habitat or habitats in which the plant usually grows and a statement of its geographic distribution. Most of the statements must be taken as generalities, subject in many instances to exception and incompleteness.

For the stated geographic ranges, especially for widely distributed species, we relied upon relatively recent taxonomic revisions whenever possible. Otherwise, we followed or adapted from ranges given in floras and manuals, particularly Small (1933), Fernald (1950), Gleason (1952), and Correll and Correll (1972). The range for each of the wide-ranging species is expressed as nearly as feasible according to the geographic areas which mark the limits of range. In most cases the northern boundary is given first, beginning at the northeast, in the style of the widely used floras by Fernald and Gleason.

The general reference list at the end of this book includes, for the most part, publications cited in the text. Additionally it includes some general references, such as Sculthorpe (1967) and Cook (1974), which, besides including very valuable general information concerning aquatic plants, have very extensive and useful literature citations. In some cases, we have given full reference in the text to articles not in the general reference list, the thought being that they would have greater value to the user if placed with the treatment of the taxon to which they specifically applied.

DISTRIBUTION OF AQUATIC WETLAND PLANTS

The subject of this work, aquatic and wetland plants, would seem to carry with it the assumption that some definitive physical boundaries exist so that one can attribute a given plant's occurrence to an aquatic habitat or to a wetland habitat. This is true, however, only to a very limited extent, for the physical boundaries are generally not precise, neither are the habitat requirements or tolerances of a great many species. Some sites, which have waterlogged soils during times of high precipitation, may dry out completely during intervening drought periods.

Aquatic and wetland plants commonly are present sporadically in their habitats. Plants of a given species may be present in great abundance at one time, then disappear or become greatly diminished in number, reappear later, oftentimes several or many years later. On the shores of karst lakes and ponds, for example, where water levels fluctuate greatly, the wet sands, peats, or sandy peats during times of low water are sometimes inhabited by dense populations of certain species, by populations of other species during other times of low or high water. In karst areas such lakes or ponds probably fluctuate not only in relation to surface water draining into them but also in relation to underground water courses. Some sometimes fluctuate considerably from year to year, sometimes remain at high or low water levels continuously for relatively long intervals. It appears plausible that populations of some species appearing on their exposed shores may have underground parts remaining viable but dormant when submersed; others may have seeds which have long dormant periods when submersed. In the latter case, germination of the seeds may not only require an exposed substrate, but also may require a particular set of environmental conditions prevailing simultaneously in order that germination be induced.

Populations of species characteristically inhabiting boggy pine savannas and flatwoods also vary greatly in number present at a given time. Their periodicity is, in our judgment, attune to periodicity of fire. Many kinds have underground parts which may remain wholly or partially dormant during fire-free intervals, or may have seeds with extended dormancy. In either case, they appear to be fire adapted.

TAXONOMIC COVERAGE

With respect to taxonomic coverage, we admit to having exercised many arbitrary choices as to whether or not certain species should be considered as inhabitants of wetlands. Anyone who must decide what plants of a given area are associated with excessive water during at least a part of their life spans will sympathize with the mental anguish accompanying such selection. Some species which are clearly inhabitants of aquatic or wetland places were excluded on other grounds, for example, certain ones of rare and local occurrence not likely to be found anywhere in any abundance. In addition, a few species are in the account only because their inclusion was considered helpful to the problems of identification. Since, after all, the treatment is for an arbitrarily selected portion of a region's total flora, personal biases were indulged which will show us to have been somewhat inconsistent. Criticism for having included certain plants, for not having included others, may confidently be expected.

HABITATS

Natural lakes and ponds in our region are much more prevalent in the coastal plain than elsewhere and they are especially numerous in Florida. Man-made farm ponds occur more or less throughout, as do larger impoundments associated with flood control, hydroelectric power production, and navigation. Other habitats with open water include streams of assorted sizes, swamps, springs, ocean waters and estuaries, bays, lagoons, drainage and irrigation ditches and canals. It is in the foregoing principally that aquatic plants occur, plants with their parts wholly submersed, or partially submersed and partially floating, or only their flowering and fruiting parts emersed.

There is, of course, no sharp line of demarcation between open-water aquatic and marsh vegetation. We conceive of marshes as places with fairly permanent and stable surface water (or at least with water regularly flowing over the surface in tidal situations) inhabited by herbaceous plants rooted in the substrate but with photosynthetic and reproductive organs principally emersed. Marshes or marshy situations prevail throughout our region, in coastal and estuarine tidal areas, along shores or in shallow water of ponds, lakes, streams, lagoons, sloughs, backwaters, wet meadows, drainage and irrigation ditches and canals.

Swamps are wetlands dominated by woody plants, the substrate flooded for one or more longish periods during each year, sometimes more or less permanently flooded, but usually without surface water part of the time. They occur on the floodplains of streams and in small to large depressions. During maximum flooding both aquatic and marshy type shade-tolerant herbs may abound beneath the trees; during periods of maximal drying out essentially terrestrial but shade-tolerant herbs may flourish there. Wet woodlands are tree-dominated as well but their substrates generally have water standing over them for short intervals during times of high precipitation.

Bogs are generally open or semiopen areas having a grass-sedge dominated "ground flora" with a varying admixture of plants with showy flowers. Bogs occur throughout the region of our coverage but are most conspicuous and most extensive in the coastal plain where pine savannas or flatwoods and evergreen shrub or shrub-tree bogs (bays) are distinctive.

Pine savannas or flatwoods, which occur on substrates which are waterlogged or even have some surface water during seasons of heavy precipitation, may become dry during times of low precipitation or "baked dry" during extended droughts. If periodically burned, the pines are usually scattered, the ground flora herbaceous, the latter principally grasses and sedges but with numerous kinds of showy flowering plants as well. If periodic burning is excluded, however, hardwood trees and shrubs whose top growth is continually arrested by burning, take over, relatively quickly form a closed canopy which causes the herbaceous flora to become repressed, eventually to die out.

Shrub or shrub-tree bogs, commonly called bays, are flat, poorly drained, boggy areas inhabited by evergreen shrubs and trees, sometimes including conifers tolerant to long hydroperiods. Herbaceous plants are few, or scarcely any, in the bays except during short intervals after severe burning. Bay shrubs and trees quickly regenerate from underground parts after fire and again repress the herbs. Bays occur in the outer or lower coastal plain on poorly drained, broad, flat heads of streams (branch bays), on now relatively elevated flat bottoms of areas that were estuarine when the sea level was much above its present position (estuary bays), and Carolina bays, elliptical shallow basins of variable size which dot the coastal plain of the two Carolinas.

The nature and extent of aquatic and wetland plants occurring in and along rivers and streams are markedly affected by flooding and subsidence of flooding during and between periods of high precipitation. Fluctuations in river and stream flow greatly influence aquatic and marsh plant populations in their main courses. In addition, the kinds of plant populations on the floodplains relate to both long-range and short-term hydrologic phenomena. Pools and backwaters fill and subside, floodwaters inundate floodplains to varying depths at times, much of the floodplain is relatively dry for varying periods between floods. The kinds and quantities of herbaceous vegetation, especially, differ very greatly on the floodplain through the year or from one year to the next.

Attention is drawn especially to two extraordinary wetland areas lying within the geographic boundaries of our coverage, namely the Okefenokee Swamp and the Everglades.

The Okefenokee Swamp covers parts of six counties of southeastern Georgia and extends just into Florida. Its area is somewhat over 600 square miles, its greatest width 26 miles, its greatest length 39 miles. Its principal effluent is the Suwannee River, although the St. Mary's River drains some of its eastern part. Persons interested in a detailed account of habitats and vegetation of the Okefenokee are referred to Wright and

Wright (1932). For a very interestingly written account of early exploration, of exploitation of its timber resources, of schemes put forth to have the Swamp yield up some of its other riches, and not least for the rich perspective of a man who spent most of his working life in it and about it, we recommend the following: "Forty-five Years with the Okefenokee Swamp—1900–1945" by John M. Hopkins (Georgia Society of Naturalists Bulletin No. 4 (undated)).

An outstanding natural feature of southern Florida (and one of the unique regions of the earth) is (or was!) the Everglades. The Everglades is a great flat expanse, a rock filled basin with uneven topography essentially filled with peat and muck to a nearly level plain. It extends in a broad belt roughly from Lake Okeechobee southward and southwestward nearly to Cape Sable, its boundaries encompassing approximately 750 square miles of area. It is prevailingly marshy but does not by any means exhibit a uniform vegetational cover. Davis (1943) describes six main vegetational types and the reader is referred to his work for detail (and for detail about southern Florida's extensive cypress swamps as well). Highly recommended to the reader is the beautifully written popular book by Marjory Stoneman Douglas, *The Everglades: River of Grass,* Hurricane House, Coral Gables, Florida (1947).

The Everglades is now greatly changed from its pristine condition owing to an extraordinary system of drainage canals, dikes, etc., chiefly related to flood control on the one hand and "reclamation" of lands for agriculture on the other. Some parts, notably the so-called water management areas, reflect a reasonable image of what much of it may have been like before the hand of man changed its face so drastically.

ENVIRONMENTAL PERSPECTIVES

Presently we are acutely aware of diverse problems deriving from utilization of water and management of water resources. Wetlands generally, and coastal wetlands particularly, are recognized as significantly related to the welfare of wildlife and fisheries. Rivers and impoundments are increasingly important in both navigation and recreation. Wetlands, in some places, Florida, for example, relate importantly to subterranean water supplies upon which both agricultural and urban interests rely. Drainage, flood control, extension of waterways to form "dead-end" watercourses in residential areas create an admixture of aquatic plant (and other) problems. Commercial interests vending aquatic plants to the aquarium trade, apparently a big business, allegedly "plant" exotic aquatics in streams, ponds, lakes, drainage canals and ditches where some of them, at least, become a menace to navigation, to water quality, to drainage, that is, they become pollutants.

A direct economic value of wetland plants may be perceived as virtually nil, other than that they contribute aesthetically to the general landscape. However, wetlands, conceived not just as physical features but as ecosystems, relate to the general economics in a many faceted, intricately webbed fashion. Water resources, water utilization, and water quality, management of wildlife and fisheries resources, are notable among the considerations that give wetlands importance.

Clogging of impoundments, drainage and irrigation ditches and canals, channelized streams, or other water areas contrived by man, is commonly attributable to aquatic and marsh plants introduced from floras other than our own, that is, to exotics. Some of the most notable and pestiferous (including dicotyledons) are: water hyacinth (*Eichhornia crassipes*), alligator weed (*Alternanthera philoxeroides*), hydrilla (*Hydrilla verticillata*), Brazilian waterweed (*Egeria densa*), and Asian water milfoil (*Myriophyllum spicatum*).

In such waters, and in addition in natural waterways or bodies of water where accidental or purposeful manipulations—pollution, for example—in one way or another alter natural environmental regimes, various native plants contribute to weed problems. Some among the many with such potential are water willow (*Justicia americana*), cattails (*Typha* spp.), frog's bit (*Limnobium spongia*), torpedo grass (*Panicum repens*), smartweeds (*Polygonum* spp.), *Ludwigia* spp., water-lilies (*Nymphaea* spp.).

spatter-docks (*Nuphar* spp.), lotus (*Nelumbo lutea*), fanwort (*Cabomba caroliniana*), water shield (*Brasenia schreberi*), water-celery or tape-grass (*Vallisneria americana*), canna (*Canna flaccida*), rushes (*Juncus* spp.), spike-rushes (*Eleocharis* spp.), bulrushes (*Scirpus* spp.), and arrow roots (*Sagittaria* spp.).

The aggressive weedy action of aquatic and marsh plants in waters naturally suitable for or presumably devised to be suitable for human benefit poses economic problems for society of immense magnitude. This is not perceived by us as a proper forum in which to elaborate upon the intricacies inherent in reaching measures of prevention or control both economically and environmentally sound.

On the coasts of Florida, as conditions become increasingly tropical, coastal salt marshes give way in considerable part to mangrove swamps. On the Atlantic coast this commences at the north at about St. Augustine, on the Gulf coast at about Cedar Key, the greatest development of mangrove communities being along the southwest coast of the peninsula. Mangroves play an important geologic role in building the coasts farther out into the water, in forming islands, in the accumulation of peat and marl deposits. They afford significant protection to the coasts from storms and are vital to fisheries and wildlife (Davis, 1943). Husbanding of the mangrove resource is one of those wetland concerns relating to environmental quality over which the state and the nation must be ever watchful.

In recent years vast acreages of pine savanna and flatwoods (and some other coastal plain community types) have been greatly altered, in most cases veritably destroyed. Large areas have been drained, clear-cut, then converted to permanent pasture or to agricultural crops such as soybeans. Probably the greatest acreages have been drained, clear-cut, the sites then mechanically "cleaned" by gargantuan machines and converted to pine farming, the slash pine (*Pinus elliottii* Engelm.) being the one mostly used. In the short term following mechanical alteration of the site and the planting of pine seedlings, there is usually an explosion of populations of some, at least, of the native herbaceous plants but most of these are soon greatly diminished in number or eliminated by competition and shade, the general practice resulting in what is in essence a monoculture.

At the moment of this writing, we read in the press of a disease of slash pine which is reaching, in some places has reached, epidemic proportions. We can but exclaim that epidemic disease may have been expected as a consequence of a nearly monocultural practice in tree farming as well as in the monoculture of herbaceous crops since the checks and balances nature affords via natural organismic diversity no longer obtain. Moreover, it is not reasonable to assume that slash pine is adapted to the environmental conditions of the diverse sites upon which it is planted; it may then be under sufficient stress in many places to render it particularly susceptible to disease.

Individual persons (both lay and professional), various organizations, local and national, governmental agencies, and others, presently show much concern about environmental deterioration. There is plainly evident a virgorous determination to curtail excessive destructive forces, to place at least sample ecosystems or community types in the public domain and thus to some extent to preserve them. There is, in addition, much activity, principally on the part of taxonomically oriented persons or organizations, directed toward identifying what individual species are rare, threatened, or endangered so that steps can be taken to ensure a modicum of protection to them. It would seem self-evident, since species are component parts of ecosystems, that the two sets of concerns would in large measure be one, yet one is wont to think sometimes that the twain shall never meet. Apropos of this, it is urged that both the species lovers and the ecosystem or community lovers focus additional attention to finding what manipulative management practices, imitative of natural conditions, may be necessary and useful in maintenance of that which is set aside.

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Artificial Key to the Higher Taxa of Aquatic and Wetland Monocotyledonous Plants of Southeastern United States

1. Plants diminutive, floating on or submersed in water, stranded on mud or on debris in wet places, plant body not differentiated into stems and leaves, thalluslike, rootless or with 1–few simple roots. **Lemnaceae**, p. 464

1. Plants with stems and leaves, leaves sometimes scalelike, sometimes reduced to sheaths circling the stem.

2. Marine aquatic plants.

3. Leaves opposite, in 1–3 pairs at or near the apex of short, erect branches from a rhizomatous base (genus *Halophila* of). **Hydrocharitaceae**, p. 65

3. Leaves alternate.

4. The leaves ribbonlike or straplike, about 1 cm wide, borne closely set on short, vertical shoots from rhizomatous bases (genus *Thalassia* of). **Hydrocharitaceae**, p. 65

4. The leaves much narrower, terete or flat and threadlike.

5. Blade of leaf terete or subterete (genus *Cymodocea* of). **Cymodoceaceae**, p. 32

5. Blade of leaf flat.

6. Tip of leaf blade (in unbroken leaves) with a broad median tooth and a small lateral tooth either side of the median (genus *Halodule* of). **Cymodoceaceae**, p. 32

6. Tip of leaf blade obtuse or acute, not toothed.

7. Apex of leaf obtuse. **Zosteraceae**, p. 31

7. Apex of leaf acute. **Ruppiaceae**, p. 35

2. Fresh or brackish water aquatic or terrestrial plants.

8. Leaf blade large, fanlike (palmaceous). **Palmae**, p. 455

8. Leaf blade not fanlike.

9. Stem woody.

10. Leafy stem erect, smooth; internodes hollow (genus *Arundinaria* of). **Gramineae**, p. 217

10. Leafy stem climbing by tendrils terminating stipules; internodes solid (genus *Smilax* of). **Liliaceae**, p. 571

9. Stems herbaceous.

11. Plant a floating aquatic (unless stranded at low water); leaves in rosettes, broadly cuneate or cuneate-obovate, essentially truncate at the summit, densely short-pubescent; roots conspicuously feathery (genus *Pistia* of). **Araceae**, p. 456

11. Plant not as described above.

12. Plants aquatic, wholly submersed, partially submersed, or floating, but not with any parts appreciably emersed; (this small portion of the key designed to aid in identification of forms commonly without inflorescences or flowers much of the time; if plants with inflorescences or flowers, they may be keyed, as well, from 2nd no. 12).

13. Leaves relatively short and closely set, not threadlike, the stems together with the leaves thus more or less cylindrical longitudinally.

14. The leaves mostly opposite, or in verticels (whorled).

15. Leaf bases sessile, not expanded and sheathlike (genera in). **Hydrocharitaceae**, p. 65

15. Leaf bases expanded and somewhat sheathlike. **Najadaceae**, p. 37

14. The leaves alternate and spirally arranged. **Mayacaceae**, p. 477

13. Leaves in rosettes, tightly clustered basally on short stems, or alternate, scattered on the stem, narrow and threadlike.

16. Plants floating.

17. Leaves with a central disc of purplish spongy tissue below; petiole not inflated (rosette stage of genus *Limnobium* of). **Hydrocharitaceae**, p. 69

17. Leaves without a central disc of spongy tissue below; petiole usually inflated (genus *Eichhornia* of). **Pontederiaceae**, p. 534

16. Plants not floating.

18. Leaves petiolate, blade oblong-elliptic, 15–20 cm long, 5–10 cm wide, upper surface with a marked sheen (genus *Orontium* of). **Araceae**, p. 460

18. Leaves sessile, threadlike, or ribbonlike.

19. The leaves alternately or oppositely *scattered* on the stem and threadlike.

20. Leaves opposite. **Zannichelliaceae**, p. 29

20. Leaves alternate.

20a. Stipules 2–5 cm long, their free parts 1–3 cm long (*Potamogeton pectinatus* of). **Potamogetonaceae**, p. 18

20a. Stipules to 1.5 cm long, their free parts short. **Ruppiaceae**, p. 35

19. The leaves alternate but very closely set basally and ribbonlike or straplike (genus *Vallisneria* of). **Hydrocharitaceae**, p. 74

12. Plants aquatic or terrestrial (see statement 1st no. 12).

21. Inflorescence a very dense brownish spike 12–40 cm long, with thousands of minute flowers, staminate above, pistillate below ("cattails"). **Typhaceae**, p. 11

21. Inflorescence otherwise.

22. Flowers in a single compact or glomerate head terminating an elongate scape.

23. Flowering head involucrate, buttonlike, whitish or grayish, flowers very numerous, individually not perceptible to the naked eye. **Eriocaulaceae**, p. 503

23. Flowering head globose to cylindrical, conelike, with numerous tightly imbricated scalelike bracts from each of which (except the basal ones) a single yellow (rarely white) flower protrudes, flowers mostly appearing one at a time. **Xyridaceae**, p. 479

22. Flowers not borne in single heads on elongate scapes.

24. Flowers in the axils of chaffy bracts or scales and more or less hidden by them, usually only the stamens or styles protruding at anthesis.

25. Leaves usually 2-ranked on the stem; leaf sheaths split lengthwise on the side opposite the blade. **Gramineae**, p. 81

25. Leaves 3-ranked on the stem; leaf sheaths not split lengthwise but continuous around the stem (unless ruptured in age). **Cyperaceae**, p. 238

24. Flowers not in the axils of chaffy or scaly bracts, or if subtended by bracts the flowers then exceeding the bracts or equalling them and not concealed.

26. Plants aquatic, wholly submersed or partly floating (unless stranded at low water); flowers or inflorescences submersed, floating, or barely raised above the water surface.

27. Inflorescence a golden yellow spadix; leaves with stout petioles to 2 dm long, blades to 2 dm long and a third as wide (genus *Orontium* of). **Araceae**, p. 460

27. Inflorescence not a spadix; leaves not as described.

28. Leaves basally clustered (genera *Blyxa, Vallisneria, Ottelia, Limnobium* of). **Hydrocharitaceae**, p. 65

28. Leaves scattered on the stem.

29. Leaves opposite or in verticels.

30. Leaves opposite (if appearing whorled, then with dilated bases).

31. Leaves toothed, with dilated bases. **Najadaceae**, p. 37

31. Leaves entire, with narrow bases. **Zannichelliaceae**, p. 29

30. Leaves in many verticels along the stems, the bases not dilated (genera *Egeria, Hydrilla, Elodea* of). **Hydrocharitaceae**, p. 65

29. Leaves alternate.

32. The leaves keeled, especially toward the base. **Sparganiaceae**, p. 15

32. The leaves not keeled.

33. Leaves threadlike, less than 1 mm wide, bases of leaves with stipules 1.5–5 cm long.

34. Stipules to 1.5 cm long, their free parts short. **Ruppiaceae**, p. 35

34. Stipules 2–5 cm long, their free parts 1–3 cm long (*Potamogeton pectinatus* of). **Potamogetonaceae**, p. 18

33. Leaves not threadlike, bases of leaves with stipules less than 1 cm long, or stipules free from leaf bases or absent.

35. Leaves with stipules. **Potamogetonaceae**, p. 16

35. Leaves without stipules. **Mayacaceae**, p. 477

26. Plants terrestrial, or if in shallow water then the flowers or inflorescences emersed (except during times of flooding).

36. Perianth absent or of bristles or scales, if present none of its parts petallike in color or texture.

37. Inflorescence a spadix, in some genera the spadix surrounded or subtended by a spathe. **Araceae, p. 456**

37. Inflorescence not a spadix.

38. Flowers in globose unisexual heads, the uppermost heads staminate, the lower pistillate. **Sparganiaceae, p. 15**

38. Flowers not in globose unisexual heads, if in heads the flowers bisexual.

39. The flowers in a bractless raceme; carpels 3 or 6, connivent but separating at full maturity, each 1-seeded. **Juncaginaceae, p. 43**

39. The flowers variously arranged but not in bractless racemes; carpels 3 but fully united, fruit a loculicidal capsule either with 3 seeds or with very numerous minute, powderlike seeds. **Juncaceae, p. 542**

36. Perianth present and with at least the inner segments petaloid (in some with petaloid staminodia).

40. Leaves small, sessile, not over about 3 cm long.

41. The leaves alternate. **Mayacaceae, p. 477**

41. The leaves opposite or whorled (genera *Egeria, Elodea, Hydrilla of).* **Hydrocharitaceae, p. 65**

40. Leaves (including petioles if any) much longer than 3 cm.

42. Perianth segments densely pubescent, at least exteriorly.

43. Leaves linear, equitant; flowers yellow. **Haemodoraceae, p. 607**

43. Leaves cordate-ovate to lanceolate, not equitant; flowers blue (genus *Pontederia* of). **Pontederiaceae, p. 534**

42. Perianth not densely pubescent.

44. Pistils several to numerous (in flowers having pistils), free from each other or coherent only basally.

45. Each pistil ripening into a 1-seeded indehiscent fruit. **Alismataceae, p. 44**

45. Each pistil ripening into a many-seeded dehiscent follicle. **Butomaceae, p. 63**

44. Pistil 1 in each flower.

46. Ovary superior.

47. Perianth slenderly tubular basally. **Pontederiaceae, p. 534**

47. Perianth segments free, or if united then only at the very base, not tubular.

48. Leaves with sheathing bases. **Commelinaceae, p. 531**

48. Leaves not having sheathing bases. **Liliaceae, p. 571**

46. Ovary inferior.

49. Leaves minutely scalelike. **Burmanniaceae, p. 623**

49. Leaves well developed.

50. Perianth tubular, exteriorly wrinkled and roughened, with 6 small segments at the summit (genus *Aletris* of). **Liliaceae, p. 588**

50. Perianth not as above.

51. Stamens petaloid, comprising the most showy part of the flower, one bearing a fertile anther on its side.

52. Ovary and fruit warty; capsule 3-locular, each locule with several seeds. **Cannaceae, p. 619**

52. Ovary and fruit smooth; capsule with 2 aborted locules, the third 1-seeded. **Marantaceae, p. 621**

51. Stamens not petaloid.

53. Plants submersed or floating, essentially aquatic. **Hydrocharitaceae, p. 65**

53. Plants terrestrial, of bogs, marshes, swamps, usually no more than their bases submersed (except during times of flooding).

54. Flowers strongly bilaterally symmetrical; lowermost, or sometimes uppermost, of the 3 inner perianth segments strikingly different from the other 2, forming a lip. **Orchidaceae, p. 626**

54. Flowers radially symmetrical.

55. Stamens 3. **Iridaceae, p. 609**

55. Stamens 6.

56. Flowers yellow. **Hypoxidaceae, p. 604**

56. Flowers not yellow, mostly white, or white tinged with pink. **Amaryllidaceae, p. 598**

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Typhaceae (CAT-TAIL FAMILY)

Typha (CAT-TAILS)

Erect, perennial, rhizomatous herbs. Leaves long-linear, glabrous, distichously arranged, sheathing at the base, the sheath cylindrical, auricled or tapering at the shoulder. Flowers unisexual (the plants monoecious), densely crowded in terminal, elongate, cylindric spikes, the staminate above the pistillate. Staminate flowers of 2–5 (usually 3) stamens, filaments united, intermixed with long hairs or bracts, anthers linear. Pistillate flowers of 1 pistil, the ovary on a long hairy stalk, 1-celled and 1-carpelled, the style 1, usually filiform, stigma linear, lance-linear, lance-ovate to spatulate. Sterile flowers present, on long hairy stalks which end in swollen, aborted ovaries. Fruit a minute achene with a persistent style and elevated on a long hairy stalk.

1. Leaves flat on back; staminate and pistillate portions of spike usually contiguous; pistillate bracts none. 1. *T. latifolia*
1. Leaves convex on back; staminate and pistillate portions of spike usually separated by an interval.
  2. Leaf sheaths auricled at their shoulders; pistillate portion of spike dark brown.
    3. Pistillate bracts usually none; pith yellowish buff; stigmas lance-linear, slightly fleshy. 3. *T. glauca*
    3. Pistillate bracts present, dark brown, spatulate, blunt; pith white; stigmas linear, not fleshy. 2. *T. angustifolia*
  2. Leaf sheaths tapering at their shoulders; staminate bracts cuneate, laciniate, brown; pistillate portion of spike light cinnamon brown. 4. *T. domingensis*

1. **Typha latifolia** L. COMMON CAT-TAIL. Fig. 1

Plant coarse and stout. Pith at base of stem white. Leaves light green, 8–15 mm wide. Leaf sheaths cylindrical, tapering to blade. Spike usually about 6 times as long as thick, from 10–18 cm long, 1.8–3.0 cm thick, usually thicker toward base than at apex. Stigmas brown, lance-ovate, conspicuously fleshy, usually long persistent. Staminate bracts simple, hairlike, white. Pollen grains in fours.

Marshes, shallow water, river banks, wet ditches. N. Fla. to Alaska, throughout most of the U.S. and into Mex.

2. **Typha angustifolia** L. NARROWLEAF CAT-TAIL. Fig. 1

Plant slender. Leaves less than 6 mm wide, dark green. Pith at base of stem white. Leaf sheaths usually auriculate. Spike usually 6–10 times as long as thick, from 8–20 cm long, 1.3–2 cm thick, not thicker at base than at apex. Stigmas dark brown, linear, not fleshy, persistent to deciduous. Staminate bracts brown, simple or forked, hairlike to linear. Pollen grains single.

Fresh or brackish waters. N.S., n. Maine, s. Que. and Ont. to n.e. Fla., Ga. to Mo., Nebr., to s. Tex.; Calif.; Euras.

3. **Typha** × **glauca** Godron.

Hybrid between *T. angustifolia* and *T. latifolia.* Pith at base of stem yellow-buff. Leaves bluish green, 6–12 mm wide. Leaf sheaths usually auriculate, sometimes tapering. Spike usually 6–10 times as long as thick, from 10–25 cm long, 1.8–2.5 cm thick, not thicker at base than apex. Stigmas reddish brown, lance-linear, slightly fleshy, usually persistent. Staminate bracts simple or forked, hairlike, whitish to light brown. Pollen grains single.

Fresh or brackish lakes, ponds, rivers, sporadic, mostly in places where the parents grow near together.

4. **Typha domingensis** Pers. SOUTHERN CAT-TAIL.

Plant slender, the tallest of the cattails. Leaves 6–12 mm wide, light yellowish green. Pith

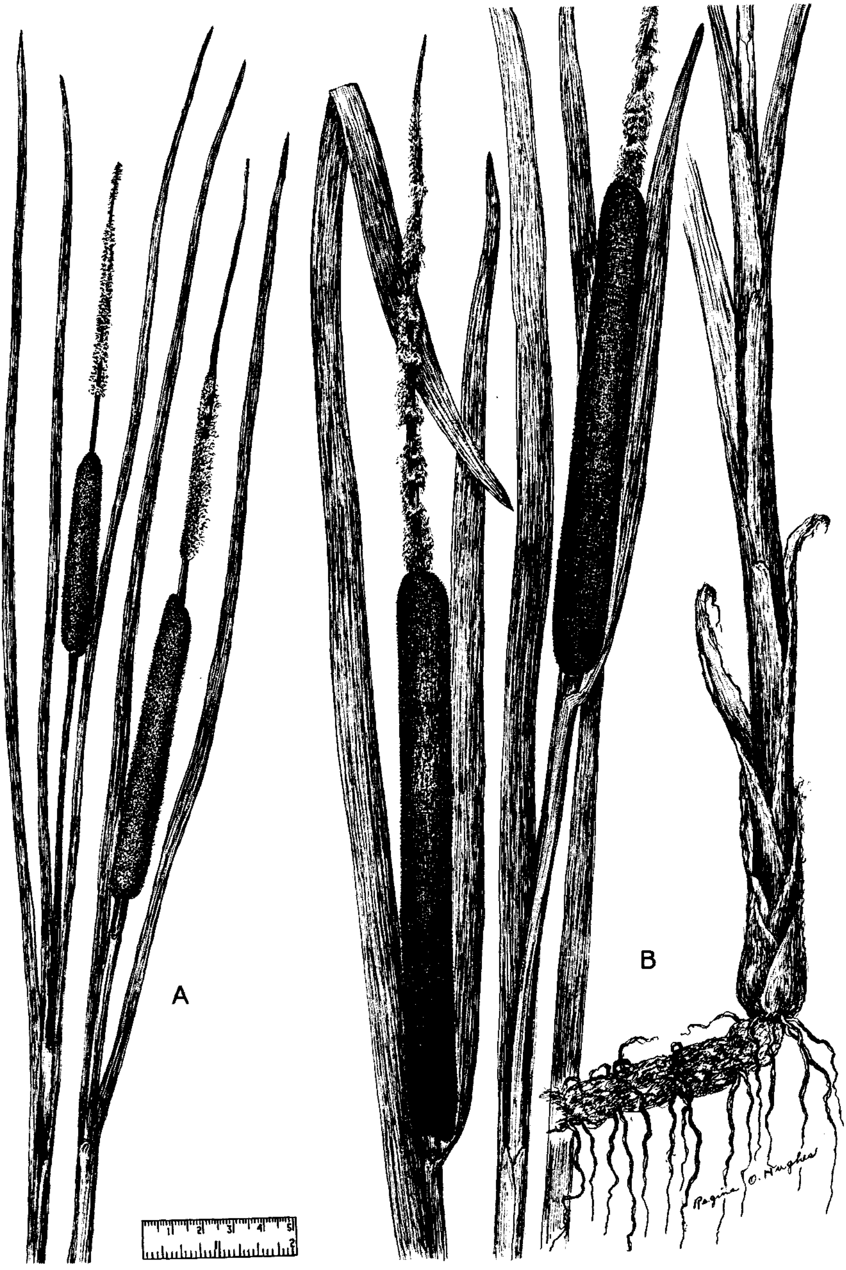
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Fig. 1. A, **Typha angustifolia**; B, **Typha latifolia**. (From Reed, *Selected Weeds of the United States* (1970) Fig. 4)

at base of stem white. Leaf sheaths tapering into the blade. Spike usually about 10 times as long as thick, 15–25 cm long, 1.5–2.2 cm thick, not thicker at base than at apex. Bracts of the pistillate flowers brown, ovate and apiculate. Stigmas light brown, linear, not fleshy, quickly deciduous. Staminate bracts cuneate, laciniate, brown. Pollen grains single.

Fresh or brackish marshes. Del., e. Md. to Kans., s. to s. Fla. and Tex.; Utah, Nev., n. Calif.; trop. Am.

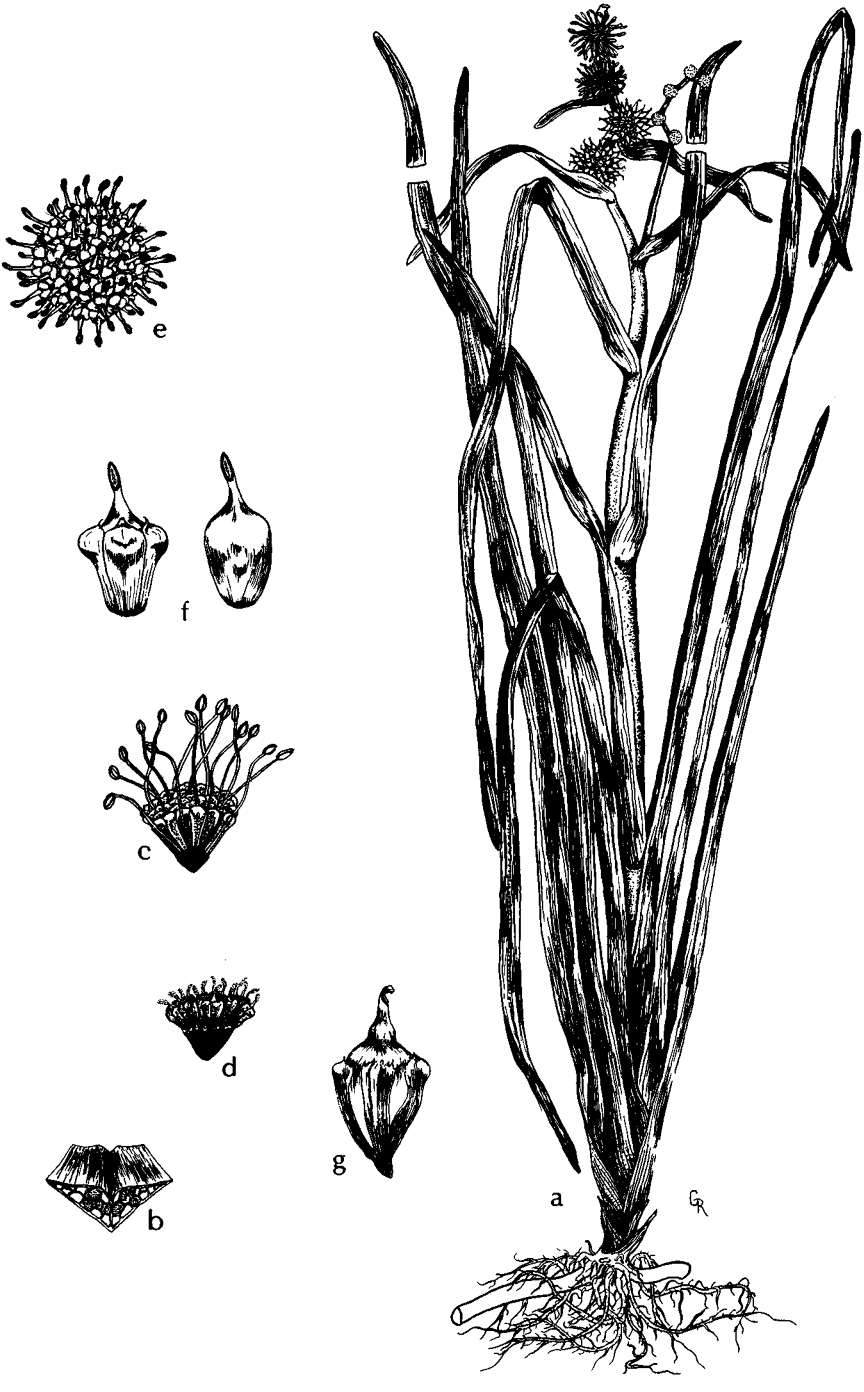

Fig. 2. **Sparganium americanum:** a, habit; b, cross-section of leaf; c, portion of staminate head; d, portion of pistillate head; e, pistillate head; f, fruits, with and without perianth scales; g, mature fruit.

Sparganiaceae (BUR-REED FAMILY)

Sparganium americanum Nutt. BUR-REED. Fig. 2

Herbaceous perennial with slender rhizomes. Stems erect, up to 6–10 dm tall, leafy from the base and terminated by the inflorescence; lower leaves much overtopping the inflorescence. Leaves bright green, sessile, alternate, 2-ranked, ascending, elongate-linear, about 2 cm wide, keeled below, flat above but with a channel above the midrib from the leaf base to about the middle of the leaf; leaf thickish and spongy, the margins smooth. Inflorescence axis simple or with 1–several short branches, somewhat zigzag below, the flowers borne in compact, globose heads in the axils of bracteal leaves (below) or more reduced bracts (above). Lowermost heads of the axis, or of a given branch, of pistillate flowers, the uppermost of staminate. Perianthlike portion of the pistillate flower of 5 submembranaceous, translucent scales; scales slightly broadened upward, their summits pointed in the flowers and in fruit truncate and fringed; back of the scale, just below the summit, bearing a rounded, spongy-thickened knob; scales closely appressed to the ovary, at anthesis reaching the summit of the ovary, in fruit about to its middle. Stigma 1, elliptical, obliquely terminating a short style. Perianthlike scales of the staminate flowers attenuate below, their summits more or less spatulate, slightly less than half as long as the filaments. Staminate flowers very tightly congested, difficult to see individually even when magnified. Individual fruit of the fruiting head an achene. Achene ellipsoid to oblong-obovoid, somewhat narrowed at the base and narrowed at the apex into a beak, 6–10 mm long overall.

Shallow water of or along wet shores of swamps, ponds, streams. Que. to Minn., N. Dak., s. to Fla. and Tex.

Potamogetonaceae (PONDWEED FAMILY)

Potamogeton (PONDWEEDS)

Perennial aquatic herbs from seeds, rhizomes, tubers, or detached winter buds. Leaves alternate of one or two kinds; if of two the submersed leaves thin, often linear to linear-elongate, the floating ones of a firmer texture and wider. Stipules present, more or less fused by the margins into a sheath, or in a few species, fused to leaf base. "Flowers" bisexual, in spikes on axillary peduncles, the bud enclosed by a stipular sheath. Stamens 4, anthers 2-locular, the connectives of each produced into a broad sepaloid structure resembling a perianth segment (sepaloid appendage). Pistils 4, sessile, free, 1-locular. Stigmas sessile or on a short style. Fruit 1-seeded, with fleshy exocarp and a crustaceous endocarp.

Studies of the vascularization and floral morphology of the flowers of *Potamogeton* and related genera (Uhl, 1947) suggest that the "sepaloid appendages" are actually independent organs subtending and adnate to the stamens. Each stamen, according to this view, represents a staminate flower. The so-called flower of *Potamogeton* would thus be fundamentally an inflorescence, consisting of four staminate flowers surrounding four pistillate ones.

1. Leaves finely but conspicuously toothed (teeth evident to the naked eye). 1. *P. crispus*
1. Leaves entire (tiny, inconspicuous, 1-celled teeth occur on the margins of some taxa, but these fall very soon).
  2. Submersed leaves very narrowly linear or linear-lanceolate, usually less than 3 mm wide (many times longer than broad).
    3. Stipules axillary, free from the leaf base; floating leaves absent.
      4. Fruits rounded on the keel; peduncles slender, 1.5–8.0 cm long, rarely somewhat enlarged above; spikes with 3–5 separate few-flowered whorls. 2. *P. pusillus*
      4. Fruits with a toothed, winged keel; peduncles short, to 3.0 cm long, clavate; spikes with 1–3 contiguous whorls of 2 flowers each. 3. *P. foliosus*
    3. Stipules (at least some of them) adnate to the leaf bases, forming a sheath which enfolds the stem, the leaf appearing as though arising from the top of the sheath; floating leaves present or absent.
      5. Plants with submersed leaves only, filiform or linear-capillary; sheaths 2–3 cm long; fruiting spikes with 2–5 whorls of flowers, peduncles 3–25 cm long. 4. *P. pectinatus*
      5. Plants with long-petioled floating leaves and sessile linear-elongate submersed leaves; sheaths less than 10 mm long; if floating leaves absent, fruiting spikes of submersed parts capitate and sessile or on very short peduncles, with 1 whorl of flowers. 5. *P. diversifolius*
  2. Submersed leaves elliptic, ovate, or lanceolate, usually much over 5 mm wide.
    6. Leaves cordate or rounded at base, clasping ½ or ¾ the circumference of the stem. 6. *P. perfoliatus*
    6. Leaves petioled or tapering to a sessile base, scarcely, if at all, clasping.
      7. Stem usually with conspicuous red or black spotted, warty projections; floating blades ovate to rotund, cordate or round at base; margins of submersed leaves strictly entire. 7. *P. pulcher*
      7. Stem usually not conspicuously spotted or warty; floating blades lanceolate to elliptic, ovate or oblong-elliptic, cuneate or round at base; margins of submersed leaves with tiny, early-falling, 1-celled teeth.
        8. Leaves usually all submersed, sessile or rarely on petioles up to 4 cm long, often somewhat arcuate; apex sharp-pointed or often mucronate; fruits 2.5–3.5 mm long. 8. *P. illinoensis*
        8. Leaves of two kinds, submersed and floating, submersed on petioles 2–13 cm long, apex acutish but neither sharp-pointed nor acuminate; fruits 3.5–4.3 mm long. 9. *P. nodosus*

1. Potamogeton crispus L. CURLED PONDWEED. Fig. 3

All leaves submersed, conspicuously toothed. Rhizomes slender buff or reddish, rooting

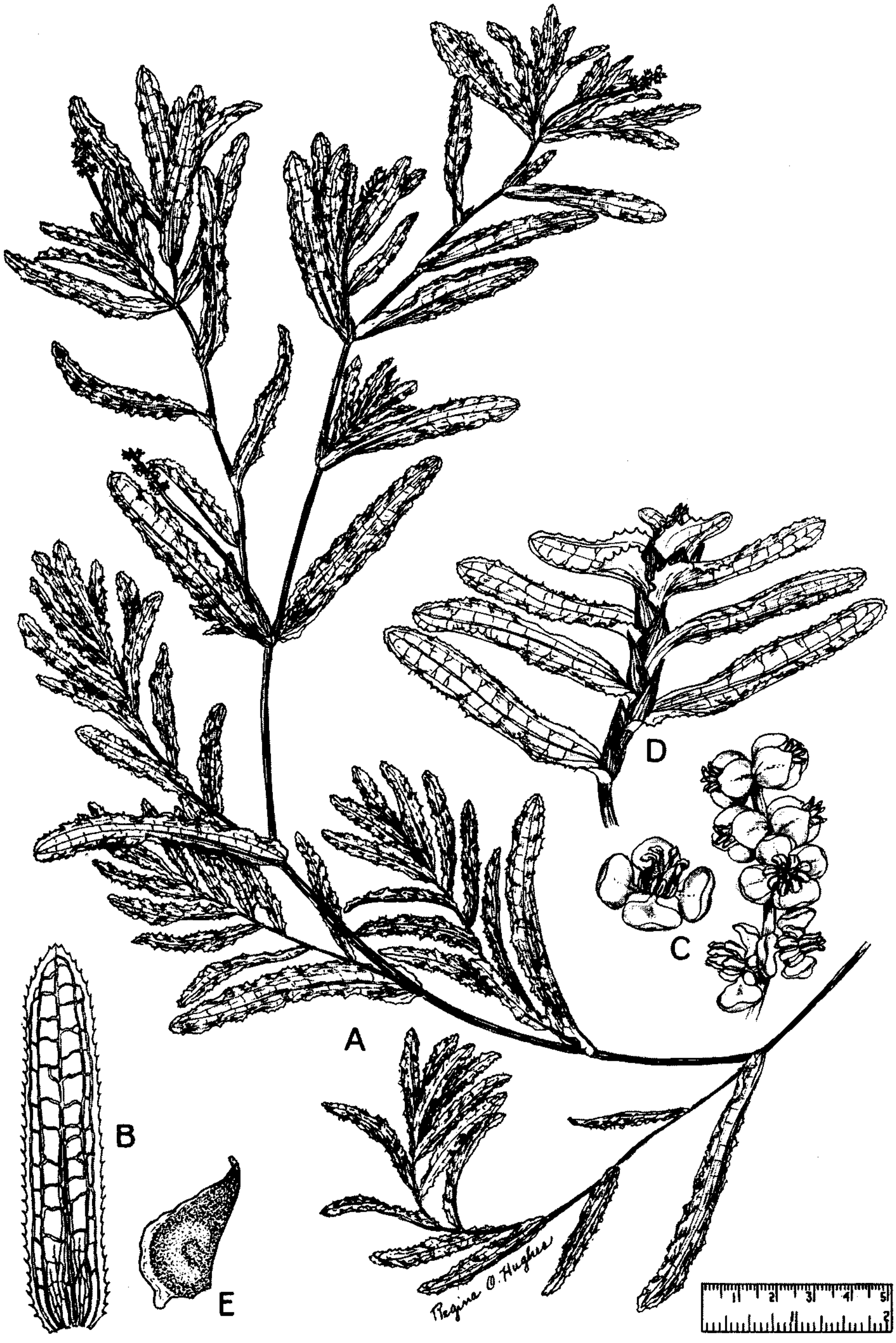
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Fig. 3. **Potamogeton crispus:** A, habit; B, leaf venation; C, flowers; D, winter bud; E, achene. (From Reed, *Selected Weeds of the United States* (1970) Fig. 5)

at the nodes. Stems flattened, channelled, freely branched above. Leaves sessile, oblong to broadly linear, 2–10 cm long, 6–10 mm wide, apices rounded, margins sharply dentate, often crisped and undulate at maturity, with a conspicuous midvein and a pair of nearly parallel laterals. Stipules thin, translucent, lacerate and soon decaying, uniting around the stem to form a sheath or ligule and free on opposite side. Peduncles slender, often recurved, 2–7 cm long. Spikes loosely flowered, in fruit to 2 cm long. Flowers sessile or nearly so. Fruits obliquely-ovate, 4–6 mm long, flattened, with stout, erect or somewhat curved beak about as long as the body of the fruit, the back keeled, keel entire or somewhat toothed, the lateral keels obscure.

Ponds and streams. Mass. to Minn., generally southward to n. Fla. and westward to N.Mex.; Calif. Introduced from Europe and sometimes an aggressive aquatic weed.

2. **Potamogeton pusillus** L. Fig. 4

Rhizomes absent. Plants probably perennial from cormlike winter buds present during certain seasons. Stems erect in the water, slender, often capillary, usually much branched, somewhat flattened, to at least 1 meter long. Leaves all submersed, light green, narrowly linear, 1–7 cm long, 0.5–3 mm wide, apices acute to obtuse, midvein prominent beneath, at least 1 pair of nearly parallel laterals present. Stipules free from leaf base, membranous to scarious, slenderly tubular, 6–17 mm long, with margins united around the stem to above the middle when young, tearing apart with age. Peduncles axillary, slender, to 8 cm long, spikes cylindric, interrupted, whorls 3–5, 6–12 mm long. Fruits obliquely obovoid, ca. 2 mm long and 1.5 mm wide, smooth, with a low, broad somewhat obscure keel, sides plump to flattened or deeply impressed ("dimpled"), the beak erect or slightly recurved. (Incl. *P. berchtoldii* Fieb.)

Ponds and streams, drainage ditches and canals. Widespread throughout much of the U.S. and Can.; Mex.; W.I.; Azores; Euras.

3. **Potamogeton foliosus** Raf. Fig. 5

All leaves submersed, stem branched. Leaves linear, slightly tapering to a sessile base, margins entire, apex acute or subacute; 3–5-nerved, midrib prominent. Young stipules free from leaf base, connate, 7–18 mm long, soon tearing apart, deciduous. Peduncles slightly thickened upwards, to 3 cm long. Spikes of 1–3 contiguous whorls of 2 flowers each. Fruits obliquely suborbicular, 1.8–2 mm long, 2–2.5 mm wide, keel winged, beak erect, broad at the base.

Fresh or brackish water of ponds, streams, lakes. Throughout temperate N.Am.; W.I.; C.Am.

4. **Potamogeton pectinatus** L. SAGO PONDWEED. Fig. 6

Submersed plant from thickly matted rhizomes bearing terminal tuberous bulblets during some seasons, often growing in very large masses. Stems slender, to at least 40 dm long, much branched. Leaves all submersed, linear-filiform, appearing to originate at top of the sheath, to at least 8 cm long and 1 mm wide, apices acute to attentuate; 1–3 nerved with strong cross-venation. Stipules prominent, united to the leaf, forming a sheath 2–5 cm long around the stem, the free tip less than half as long. Peduncles axillary, very slender, to at least 2.5 cm long. Spikes conspicuously interrupted by 2–4 unequally remote whorls, the axis of the spike becoming lax at maturity, 0.5–2.5 cm long. Fruits obliquely obovate, plump, 2.5–4 mm long, 2–3 mm wide, dorsal keel absent, lateral obscure, beak very short, usually recurved.

In fresh, alkaline, brackish, or saline waters of ponds, rivers, marshes, ocean shores. Que. and Nfld. to Alaska, eastern half of U.S., southwestward to Ariz.; s. to S.Am.; Old World.

The edible tubers have been planted in many localities to improve feeding areas for wild fowl. These introductions have probably extended the distribution of this species.

5. **Potamogeton diversifolius** Raf. var. **diversifolius.** Fig. 7

Perennial from delicate filiform rhizomes. Stems more or less erect in the water, varying

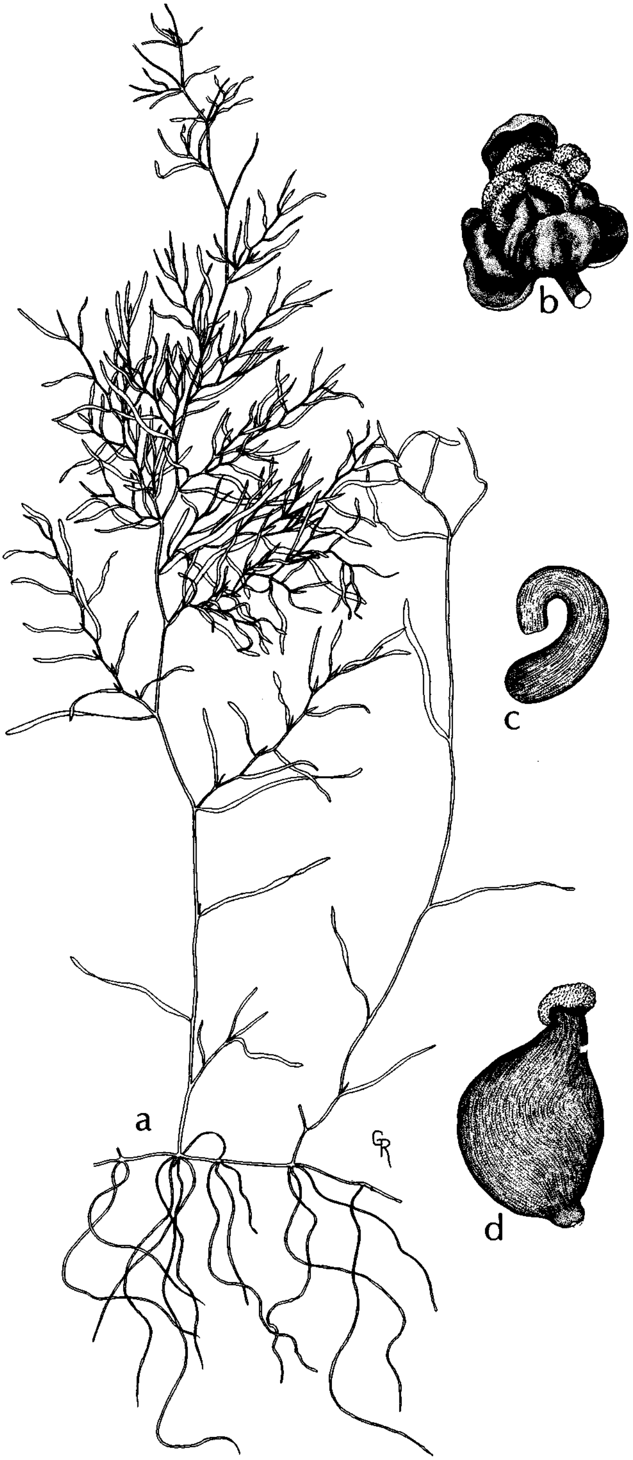

Fig. 4. **Potamogeton pusillus:** a, habit; b, flower; c, embryo; d, achene.

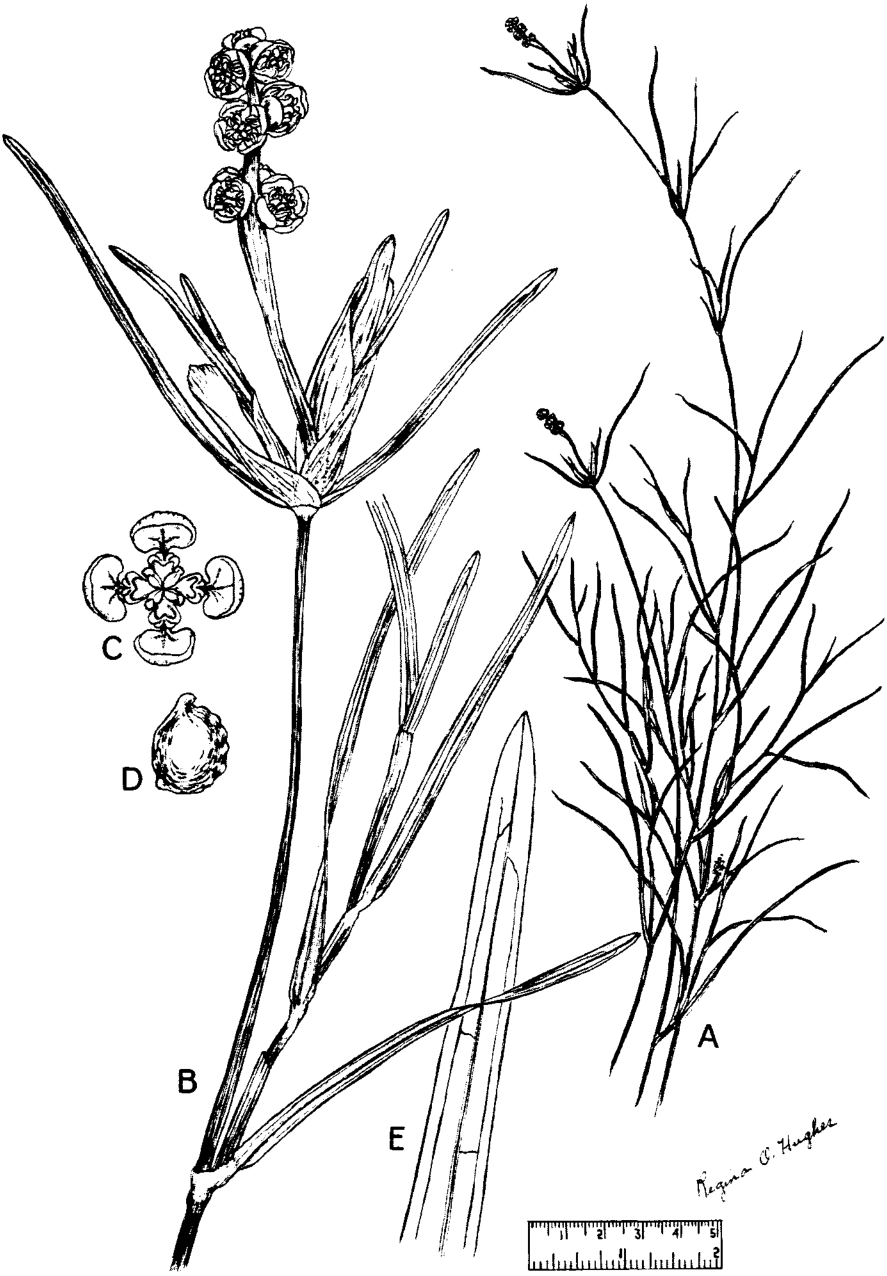
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Fig. 5. **Potamogeton foliosus:** A, habit; B, enlarged habit; C, flower; D, achene; E, leaf venation. (From Reed, *Selected Weeds of the United States* (1970) Fig. 6)

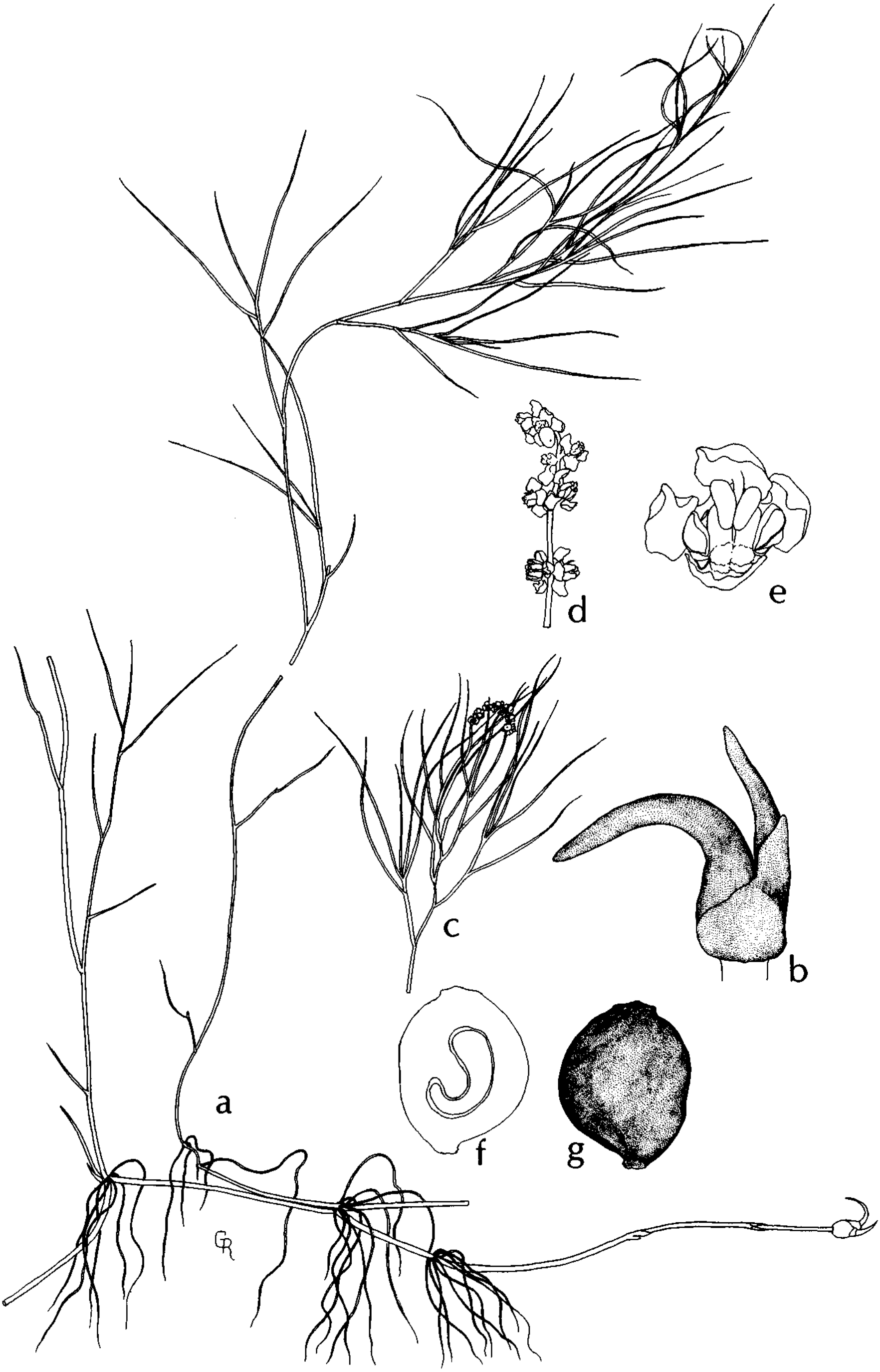

Fig. 6. **Potamogeton pectinatus:** a, habit; b, germinating tuber; c, branch tip with inflorescence; d, flowers; e, portion of flower; f, longitudinal section of achene; g, achene.

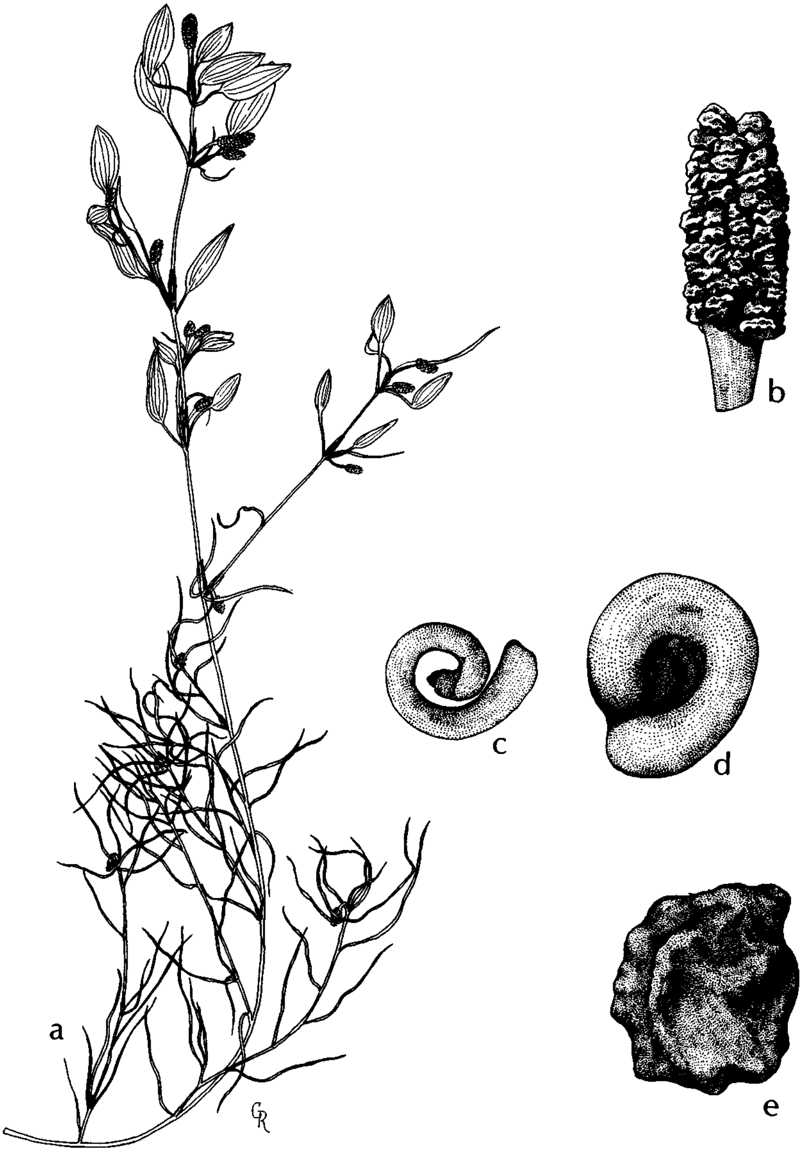

Fig. 7. **Potamogeton diversifolius:** a, habit; b, fruiting spike; c, embryo; d, embryo in endocarp; e, achene.

in height (with water depth) from ca. 15 cm to at least 1.4 m, bushy-branched below, becoming remotely so above. Leaves of two kinds; submersed ones thin, narrowly linear, to 6 cm long and to 1.5 mm wide, tapering to a sessile base, apex gradually tapering to an acute, bristlelike point, midvein evident, one pair of obscure laterals present; floating leaves usually present, coriaceous, elliptic to oval or narrowly obovate, to 4 cm long and 2 cm wide, 5–15-nerved, apex rounded, base cuneate or rounded, and a slender petiole shorter than the blade adnate to leaf base and forming a very short sheath which varies from 1–5 mm long (on a single plant). Spikes from axils of submersed leaves subglobose, few-flowered, usually shorter than the slender 1–4 mm long recurved peduncles; spikes in axils of upper and floating leaves, subglobose to cylindric, several-flowered, on peduncles 2–30 mm long. Fruit 1–1.5 mm wide, suborbicular, oblique, strongly flattened, 3-keeled, the dorsal keel prominent and somewhat undulate or tuberculate, the lateral keels low and somewhat tuberculate, sides flattish and often cochleate-sulcate, beak toothlike to nearly obsolete. The seed strongly coiled.

Quiet waters of cypress ponds, sinkhole ponds, small streams and lakes, and roadside ditches. Maine to Wis. and Mont., generally southward; s.w. U.S., Mex.; W.I.

Var. *trichophyllus* Morong. is differentiated by flaccid, setaceous submersed leaves 0.1–0.6 mm wide, stipules free or partially adnate to leaf bases. Floating leaves are lance-elliptic to oval-elliptic, acutish at apex, blades 7–26 mm long, 1–10 mm wide. Fruits have dorsal keels entire or with 3–12 small teeth. Same habitats.

6. **Potamogeton perfoliatus** L. var. **bupleuroides** (Fern.) Farw. Fig. 8

Submersed plant with whitish or pinkish rhizomes. Stems nearly erect in the water, often to ca. 2 mm thick. Leaves thin, translucent, orbicular to ovate-lanceolate, 1.5–6.0 cm long, 0.5–1.7 cm wide, apices rounded, cordate at base and clasping, margins often undulate, with tiny 1-celled teeth, blades with 11–13 veins. Stipules thin, translucent, often closely appressed to the stem, fugacious, ovate-oblong, to at least 2 cm long, apex rounded, without keels. Peduncles about as thick as the stem, 3–4.5 cm long. Spikes short-cylindric, with 2–8 whorls, in fruit 0.3–2.0 cm long. Fruits obovate, light brown or tan, round on the back, sides plump when mature, 2.5–3 mm long, 1.8–2.3 mm wide, beak prominent, keels rounded or lacking.

Calcareous or brackish ponds and streams. Nfld. to Ont., s. to Fla. and Miss.

7. **Potamogeton pulcher** Tuckerm. Fig. 9

Plant from slender white or buff rhizomes with red warty spots. Stems more or less erect, often rooting at the nodes, usually conspicuously black spotted, to 60 cm tall and 3–5 mm in diameter, not branched. Leaves of two kinds, submersed and floating; lowermost submersed leaves semiopaque, narrowly lanceolate, much shorter and narrower than the upper ones, apices rounded, margins more or less flat, venation of a conspicuous midvein and 2 nearly parallel laterals; middle and upper submersed leaves translucent, lanceolate to somewhat linear, to at least 16 cm long and 3 cm wide, apices more acute than lowest leaves, venation of a conspicuous midvein and 11–21 nearly parallel laterals; both types of leaves either nearly sessile or taper toward the base to form short flattened petioles (to 3.5 cm long), neither type is arcuate, upper ones with 4–8 rows of translucent cells (lacunae) on each side of midvein; floating leaves coriaceous, ovate to oblong-elliptic, 4–11 cm long, 1.5–8.5 cm wide, apices rounded to acute, base rounded to somewhat cordate, midvein prominent beneath, lateral veins 19–30, lacunae none or very weakly developed. Submersed stipules early decaying, those of floating leaves persistent, narrowly triangular, 2–5 cm long, apices acute, 2-keeled, thin and transparent, free to base of leaf. Peduncles 5–11 cm long. Spike with about 10 whorls, in fruit 2–4 cm long. Fruits obliquely obovate, 3–4 mm long, 2.5–3.5 mm wide, acutely keeled, dorsal (middle) one often prominent, beak prominent.

Cypress-gum swamps, small ponds and roadside pools. Eastern half of U.S.

8. **Potamogeton illinoensis** Morong. ILLINOIS PONDWEED. Fig. 10

Plant from a network of slender horizontal rhizomes. Rhizome spotted or streaked with

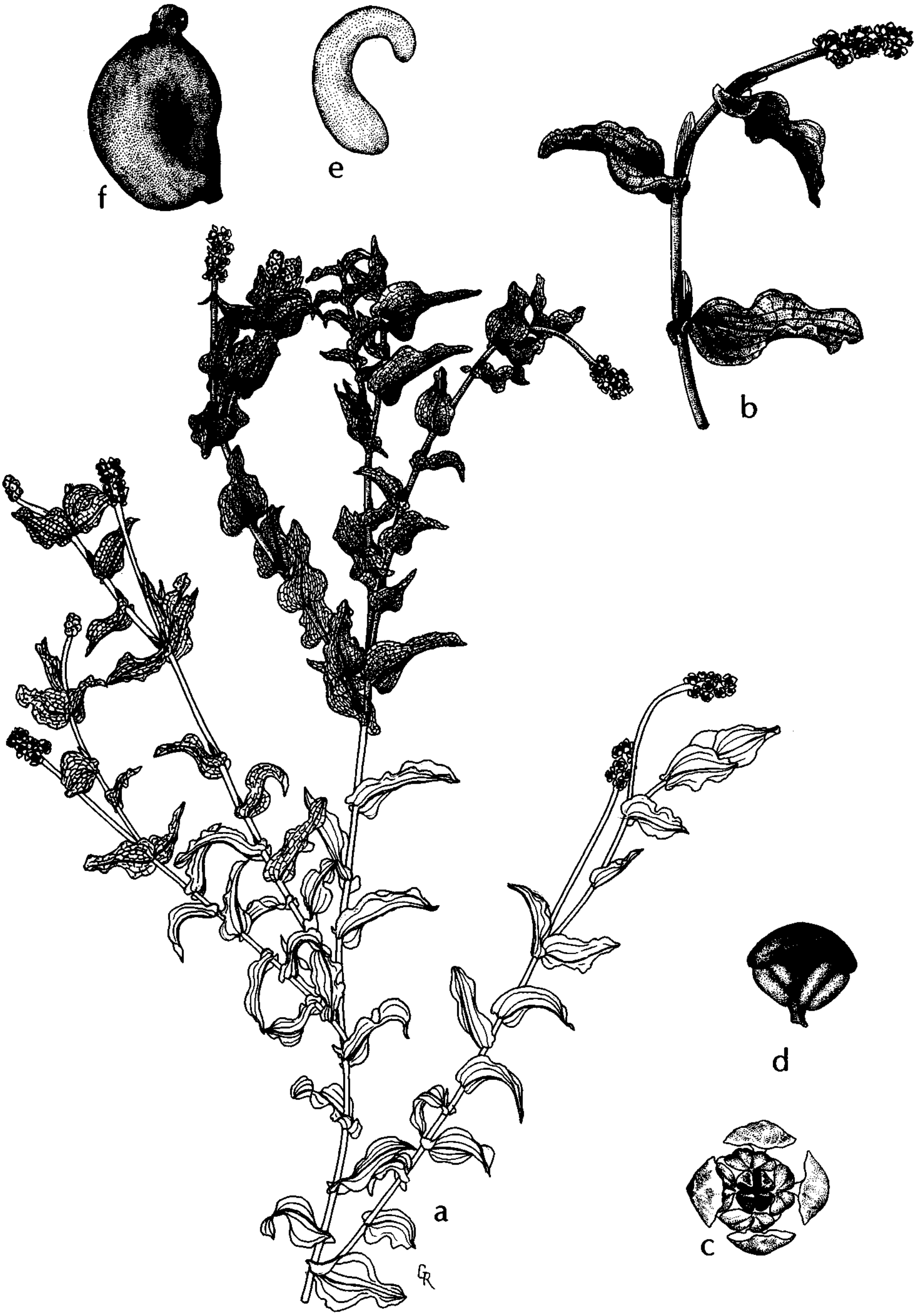

Fig. 8. **Potamogeton perfoliatus:** a, habit; b, branch tip with flowering spike; c, flower; d, anthers and sepal; e, embryo; f, achene.

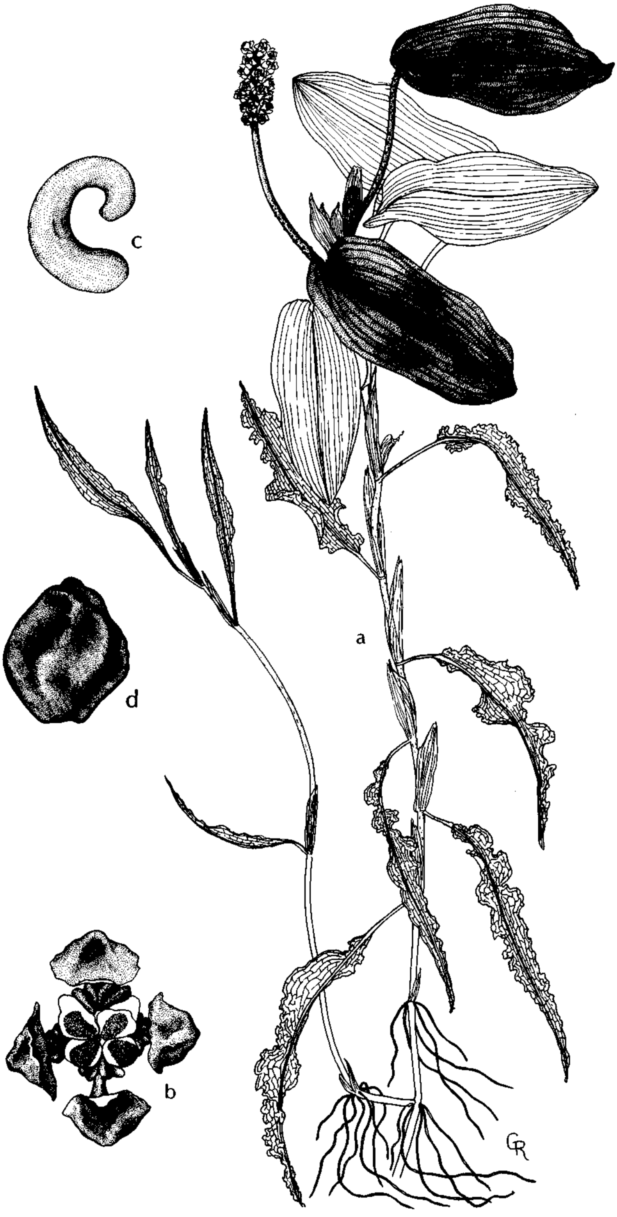

Fig. 9. **Potamogeton pulcher**: a, habit; b, flower; c, embryo; d, achene.

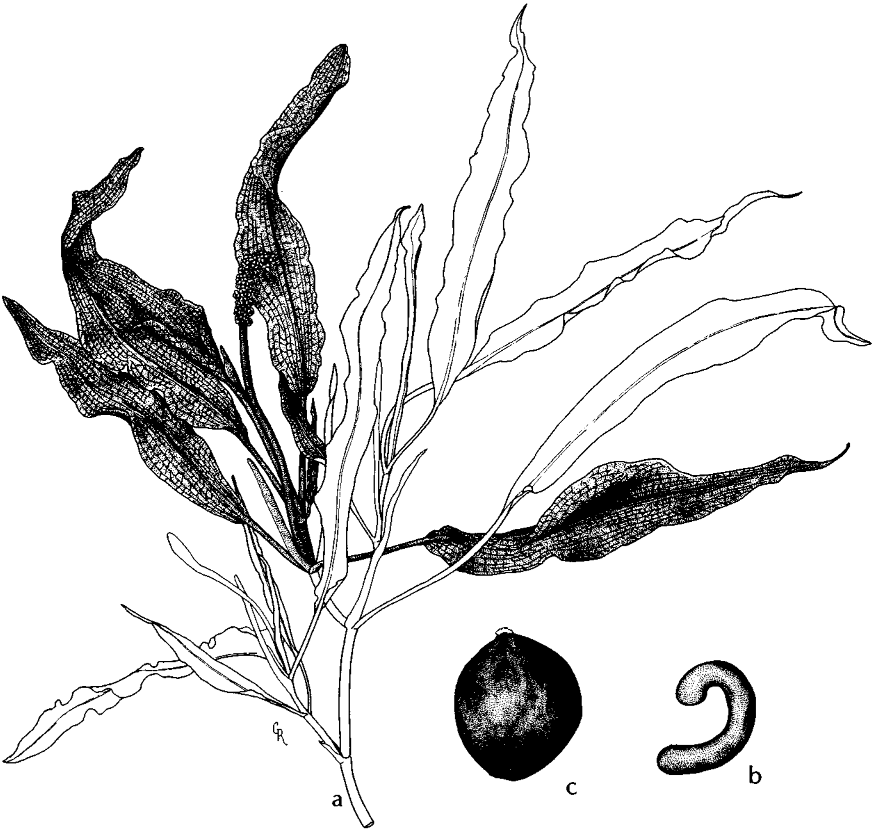

Fig. 10. **Potamogeton illinoensis:** a, branch tip with flowering spike; b, embryo; c, achene.

red. Stem more or less erect, simple or branched. Submersed leaves, thin, translucent, often arcuate, elliptic, elliptic-oblong to lanceolate or linear, blades to 18 cm long, 0.5–4.5 cm wide, apex acute, margins usually conspicuously undulate or even crisped, tiny early-falling 1-celled teeth present, midvein prominent beneath, lateral veins nearly parallel, 7–19 in number, transverse veins evident, leaves sessile or tapering into petioles up to 5 cm long. Floating leaves (often wanting or merely transitions from submersed blades) somewhat coriaceous, blades elliptic, ovate-elliptic or oblong-elliptic, 3–19 cm long, 1.5–6.5 cm wide, apex obtuse, ending in a blunt mucro, base rounded or tapering into petiole to 8 cm long, midvein prominent beneath, 13–29 secondary veins nearly parallel, evident beneath. Stipules persistent, divergent and conspicuous, prominently 2-keeled, apices obtuse. Peduncles about as thick as the stem, 4–30 cm long. Spikes compact at anthesis, of 8–15 whorls of flowers, in fruit 2–6 cm long. Fruits greenish, obovate, suborbicular, or ovate, 2.5–3.5 mm long, 2–3 mm wide, sides flat, dorsal keel prominent and acute, the laterals less so, the beak nearly erect.

Widespread in streams, lakes, ponds, ditches, chiefly calcareous. In much of s. Can., U.S., n. Mex.

9. Potamogeton nodosus Poir. Fig. 11

Rhizome white, spotted with red. Leaves of two types, submersed and floating, submersed linear-lanceolate to broadly lance-elliptic, to 20 cm long and 3.5 cm wide, tapering into a petiole 2–13 cm long; blade apex acutish but not sharp-pointed; nerves 7–15, margins with early-falling 1-celled teeth. Floating leaves lenticular to elliptic, cuneate or rounded at base, acutish to rounded at apex, to 11 cm long, to 4.5 cm wide, long petioled; nerves 9–21. Stipules brownish, 3–9 cm long. Peduncles usually thicker than stem, 3–15 cm long. Spike of 10–17 whorls of flowers. Fruit brownish or reddish, obovate, 3.5–4.5 mm long, 2–3 mm wide; keels prominent, beak short, erect.

Ponds, streams, lakes. Widespread, Can., U.S., n. Mex.

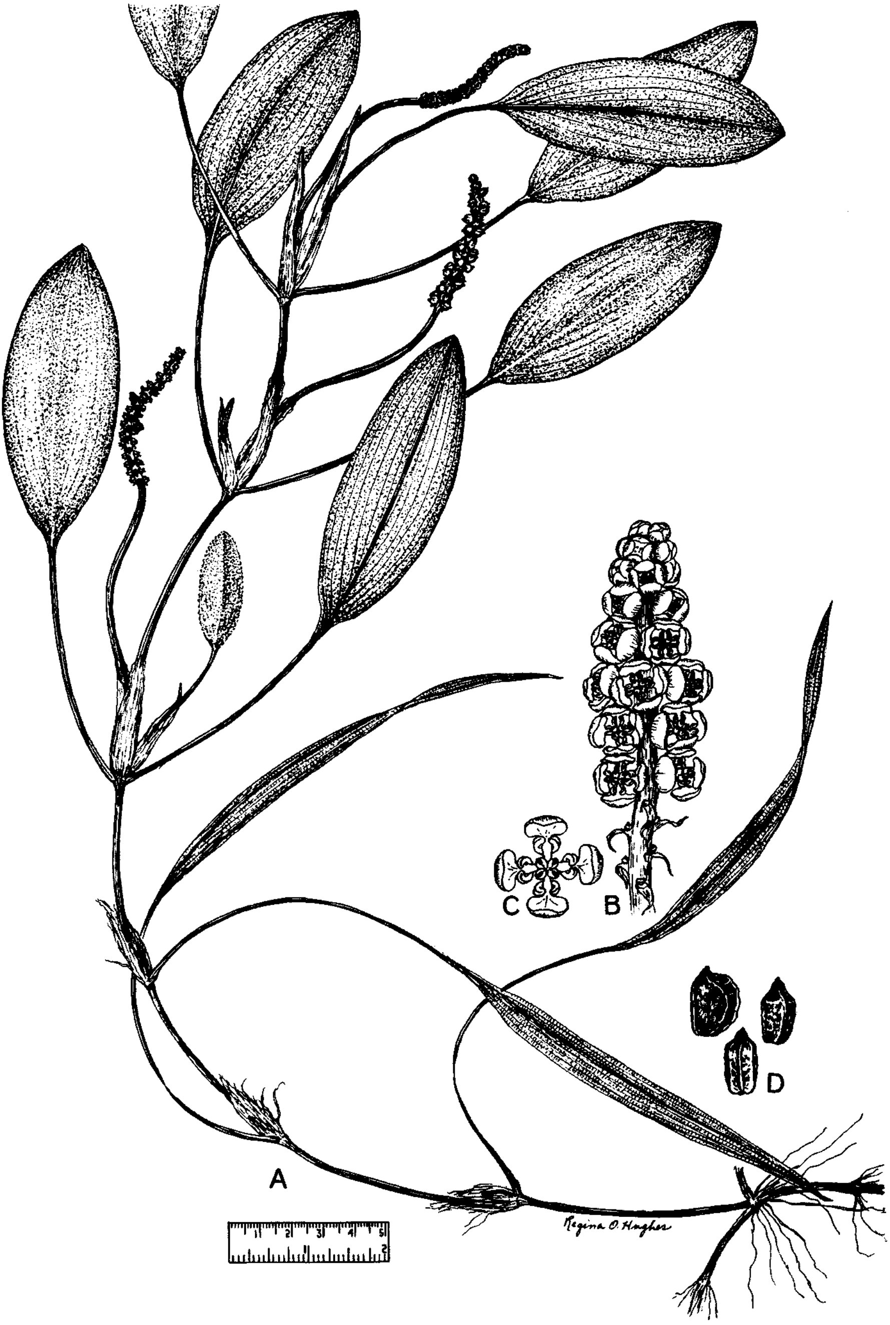
B
C
D
A
Regina O. Hughes

Fig. 11. **Potamogeton nodosus:** A, habit; B, flowering spike; C, flower; D, achene. (From Reed, *Selected Weeds of the United States* (1970) Fig. 7)

Zannichelliaceae (HORNED-PONDWEED FAMILY)

Zannichellia palustris L. HORNED PONDWEED. Fig. 12

Submersed, freely branched from slender rhizomes. Branches 2–10 dm long with sheathing stipules and opposite, narrow, flat, linear-filiform leaves 3–10 cm long, acute, 0.5 mm broad; some nodes with stipules but lacking blades. Flowers unisexual, axillary, sessile, both sexes adjacent in the same axil, the buds enclosed but flowers exserted at anthesis from the membranous stipule. Perianth absent. Staminate flower reduced to a single stamen which arises from the base of a peduncle bearing from 2–6 female flowers (each a single carpel) surrounded by a membranous cuplike, deciduous spathe or involucre. Fruit an achene, 2–4 mm long, sessile or short-stipitate, slightly falcate, tipped by a persistent style; outer face keeled with an entire or usually toothed crest.

More or less throughout temperate N.A. Semicosmopolitan. Fresh and brackish water.

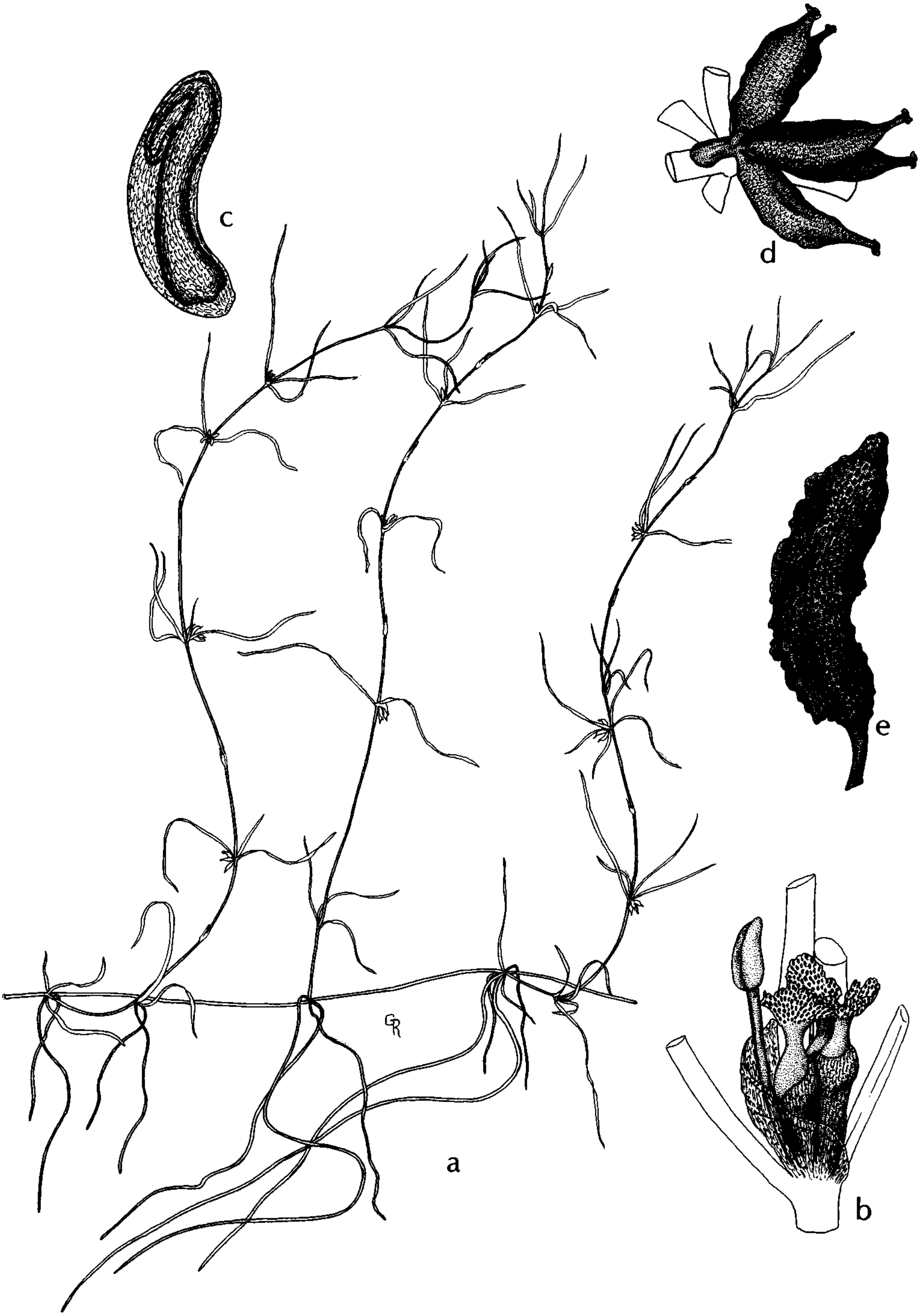

Fig. 12. **Zannichellia palustris:** a, habit; b, involucre or spathe with 3 pistillate flowers and 1 staminate; c, embryo in endocarp; d, fruiting cluster; e, fruit.

Zosteraceae (EELGRASS FAMILY)

Zostera marina L. EELGRASS.

Submersed marine herbs with slender rhizomes. Leaves flat, long and narrowly ribbonlike, to 1–1.5 dm long and 1.5–6 mm wide, somewhat leathery, 3–5-nerved, the apices obtuse; sheathed at the base, the sheaths with inflexed margins. Flowers unisexual, the plants monoecious, the 2 kinds borne alternately in 2 rows on the midrib of a portion of a leaflike spathe. Male flower merely a sessile, 1-locular anther; pollen threadlike. Female a single more or less oblong carpel attached near the apex, tapering into the style; stigmas 2, filiform. Fruit a utricle, ovate-oblong, striate, bursting irregularly. Seed 1, cylindric, several-ribbed.

Shallow sea water in estuaries, bays and coves. Greenland and Labrador to N.C., perhaps beyond (Fernald, 1950) and to Fla. (Gleason, 1952); James Bay; Pacific N.A.; Euras.

Zostera marina is considered to be the food at the base of a pyramid of living things 25 million tons of which are required to produce eventually 5 million tons of birds, 5 thousand tons of halibut, flounder and plaice, and 6 thousand tons of cod. In the early 1930s about 90 percent of the eelgrass along the eastern seaboard of North America was devastated by an epidemic fungal disease. This in turn greatly reduced animal populations dependent upon it for food either directly or indirectly. It is held that in the web of life where eelgrass is abundant, it serves as a friction filter for silts and pollutants. In its absence, where waters are siltladen and polluted, the silts, sewage and other wastes seep out of the river mouths unimpeded wiping out marine life. How bountifully the eelgrass has come back to date we do not know.

Cymodoceaceae (MANATEE-GRASS FAMILY)

Submerged marine herbs with long jointed rhizomes. Leaves with sheaths and very narrow grasslike blades borne on short erect branches from the horizontal rhizomes. Plants dioecious. Flowers borne in the leaf sheaths, without perianths; the male consisting of 2 anthers on a single stout stalk, the female of 1 or 2 pistils. Fruit a utricle.

- Leaves above the sheath terete or subterete; anthers inserted evenly on the stalk in the male; female with 1–2 pistils, each with the style divided. 1. *Cymodocea*
- Leaves above the sheath flat; anthers inserted obliquely (one somewhat above the other) on the stalk in the male; female with 1 pistil, the style simple. 2. *Halodule*

1. Cymodocea

Cymodocea filiformis (Kutz.) Correll. Fig. 13

Leaves very narrow, grasslike, sheathed at the base, blades terete or subterete, to ca 3.5 dm long. Anthers of the staminate flower evenly inserted on the stalk, usually only slightly exserted from the sheath. Female with 1 or 2 pistils borne from a short stalk, style with 2 elongate branches, somewhat exserted from the sheaths. Flowering specimens bear erect branches with several relatively conspicuous sheaths, blades long-cylindrical and flowers within the sheaths. Fruit body more or less elliptic, gradually tapering to the persistent styles. (*Cymodocea manatorum* Asch.; *Syringodium filiforme* Kutz.)

Coastal saline waters. Atlantic coast of Fla., Gulf Coast Fla. to Tex.; Ber., Carib.

2. Halodule

Halodule beaudettei (den Hartog) den Hartog. Fig. 14

Leaves narrowly linear, grasslike, flat, sheathed at the base, tips 3–toothed in unbroken leaves. Plants in water exposed at neap low tides or only at spring low tides and those never exposed have leaves differing in length and width. Flowers borne within sheaths of the branches just above the rhizome; staminate consisting of 2 anthers obliquely inserted on a single stalk, a small pigmented protuberance present on either side of the stalk just below the higher anther; anther slightly exserted from the sheath at full anthesis; pistillate consisting of 2 pistils on a stout, evident stalk, one inserted obliquely above the other, a small pigmented protuberance on either side of the stalk just below the upper pistil; ovary asymetrical, the single filiform style arising very much to one side. As the fruit develops the ovaries enlarge conspicuously asymetrically, becoming bulblike, the filiform style base persisting. Nearly mature fruit yellow, mature fruit not seen. There is some evidence that one pistil may sometimes abort. (*Diplanthera beaudettei* den Hartog; *D. wrightii* of auth., *Halodule wrightii* of auth.)

Atlantic coast, N.C. to Fla., Gulf coast, Fla. to Tex., widely distributed in Gulf of Mex. and Carib.; also Pacific coast of Pan. and Nicar.

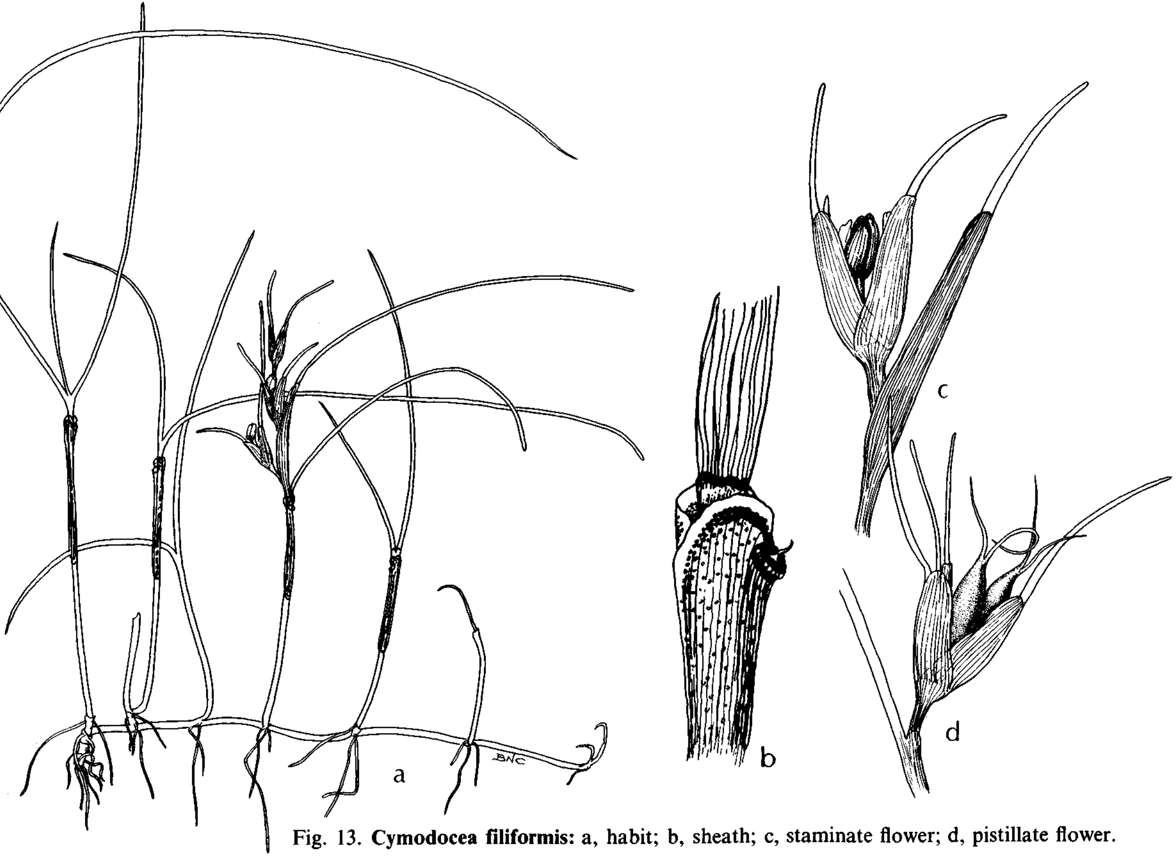

Fig. 13. **Cymodocea filiformis:** a, habit; b, sheath; c, staminate flower; d, pistillate flower.

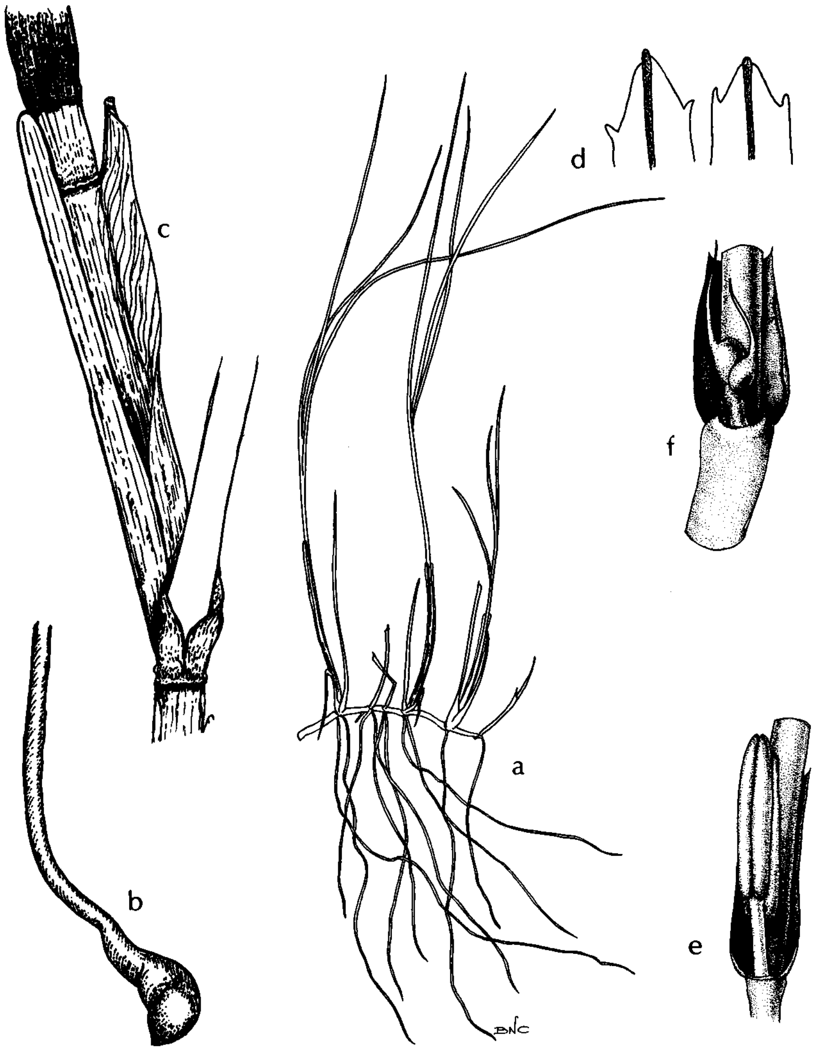

Fig. 14. **Halodule beaudettei:** a, habit; b, enlarged fleshy root; c, small portion of stem showing sheath; d, tips of leaves; e, staminate flower; f, pistillate flower.

Ruppiaceae (DITCH-GRASS FAMILY)

Ruppia maritima L. WIDGEON-GRASS. Fig. 15

Submersed aquatic herb. Stems simple or branched. Leaves alternate, threadlike, to 10 cm long, .4–.6 mm wide; apex acute; stipulate sheath to 15 mm long, membranous, the free part short. Flowers enclosed in the leaf sheath during anthesis, exerted on a loosely coiled peduncle after anthesis. Perianth absent; stamens 2, without filaments. Stigmas sessile, ovary superior. Fruiting inflorescence long-stalked; fruit dark, ovoid, equilateral or gibbous and oblique, 2–3 mm long, pedicellate stipe of nutlet to 3 cm long.

Brackish or saline waters. Cosmopolitan. One of the most valuable of submersed aquatic plants for wildlife food and cover.

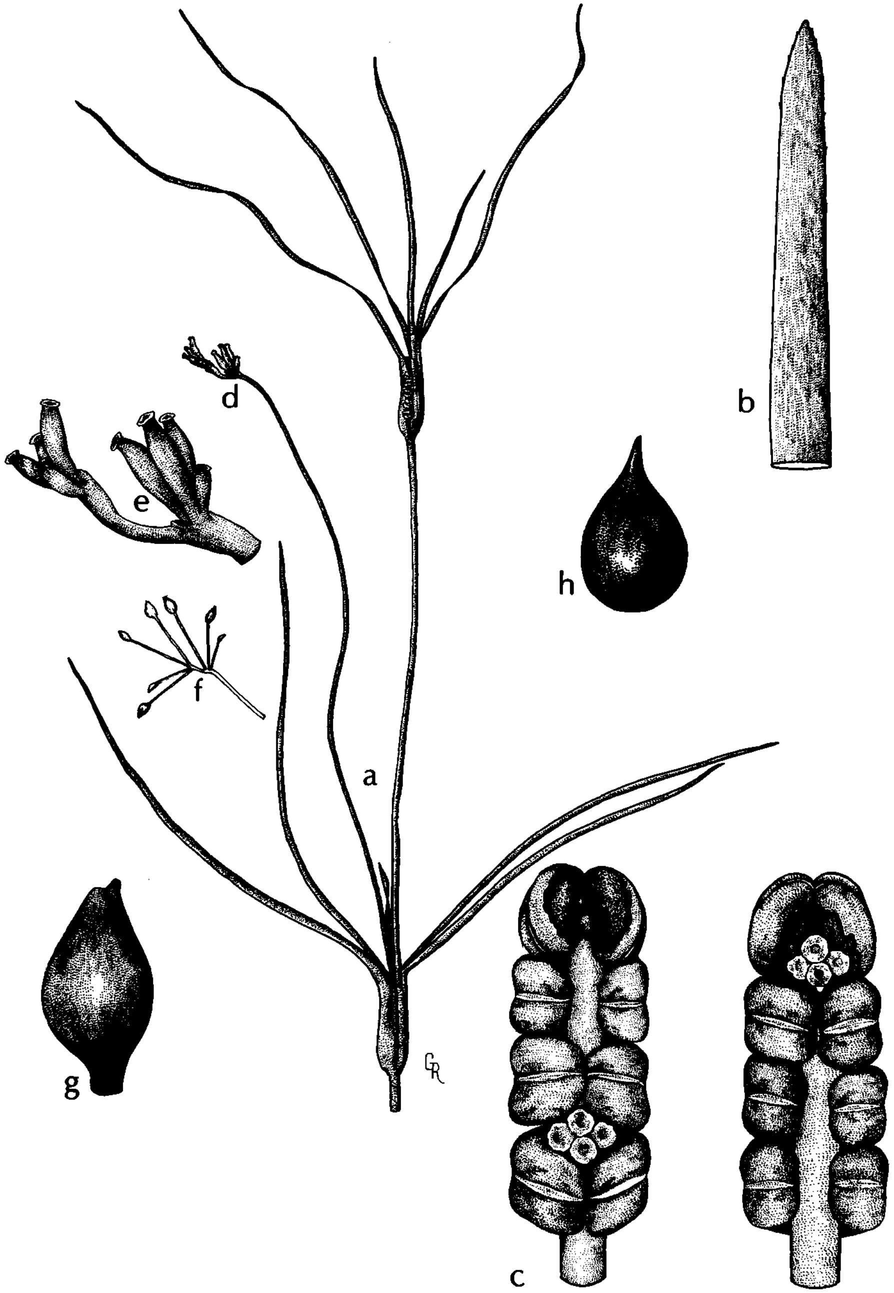

Fig. 15. **Ruppia maritima:** a, small portion of plant; b, tip of leaf; c, inflorescence with two flowers, views of opposite sides; d, inflorescence after early development of fruits and e, enlarged portrayal of same; f, tip of fruiting inflorescence at maturation showing stipes on fruits; g, fruit; h, seed.

Najadaceae (WATER-NYMPH, NAIAD FAMILY)

Najas (WATER-NYMPHS, NAIADS)

Submersed aquatic herb. Stems slender and much branched. Leaves opposite, or crowded and apparently whorled, with sheathlike bases, linear or linear-lanceolate. Plants monoecious or dioecious. Flowers very small, sessile, without a perianth. Staminate flower with 1 stamen included in a saclike perianth and a bottlelike spathe. Pistillate flower having a single ovary with 2–3 stigmas. Fruit comprised of a solitary seed surrounded by a membranous coat embraced by the leaf sheath.

1. Leaves coarsely toothed (teeth evident to the naked eye); internodes and backs of leaves spiny-toothed. 1. *N. marina*
1. Leaves almost entire or toothed as seen with magnification; internodes and backs of leaves not spiny-toothed.
  2. Sheathing leaf bases with truncately lobed or auriculate shoulders.
    3. Leaves stiff and recurved; seed ribbed, the ribs connected by transverse areolae, about 3 mm long, not recurved. 2. *N. minor*
    3. Leaves neither stiff nor recurved; seed longitudinally striate, about 2.5 mm long, recurved. 3. *N. ancistrocarpa*
  2. Sheathing leaf bases with tapering shoulders.
    4. Leaves with conspicuous marginal teeth (as seen with magnification); fruit smooth and glossy, finely reticulate. 4. *N. wrightiana*
    4. Leaves with inconspicuous marginal teeth or none; fruit smooth, not glossy, coarsely reticulate. 5. *N. guadalupensis*

1. Najas marina L. HOLLY-LEAVED WATER-NYMPH. Fig. 16

Plants brittle, armed with brownish spinulose teeth on the internodes. Leaves about 3 mm wide, with triangular teeth 1 mm long or more. Basal leaf sheaths rounded, usually without teeth. Male and female flowers on different plants. Fruit finely reticulate.

Lakes and ponds, sometimes brackish. N.Y. to Calif., s. more or less throughout the U.S.; Mex., Cuba; Euras. and Austl.

2. Najas minor All. Fig. 17

Leaves stiff and recurved, 0.2–0.3 mm wide, with coarsely spinulose teeth to 0.4 mm long. Basal leaf sheaths truncate to auriculate, with teeth continuing some distance down shoulders. Male and female flowers on the same plant. Fruit transversely reticulate, areolae broader than long.

Ponds, lakes, rivers, sporadic, e. U.S. from Lake Ontario w. to Ill., s. to Fla. Introduced from the Old World.

3. Najas ancistrocarpa A. Br. Fig. 18

Leaves slightly recurved, about 0.5 mm wide, minutely toothed. Basal leaf sheaths semiround, with few spines on margins. Fruit prominently curved.

Known to us from ponds in only 3 locations: Leon and Santa Rosa Cos., Fla. and Decatur Co., Ga. Introduced from Japan.

4. Najas wrightiana A. Br. Fig. 19

Leaves with coarsely spinulose teeth (similar to *N. minor*). Basal leaf sheaths tapering, with teeth continuing some distance down shoulders. Fruit linear, very finely reticulate. (*N. conferta* A. Br.)

Big Cypress Swamp, Fla.; trop. Am.

5. Najas guadalupensis (Spreng.) Magnus. COMMON WATER NYMPH. Fig. 20

Leaves with inconspicuous marginal teeth (often wanting), about 2 mm wide. Basal leaf sheaths sloping, finely toothed. Fruit ellipsoid, finely reticulate.

Ponds, lakes, springs, streams, ditches, fresh or brackish water. Atlantic and Gulf States, w. to Calif., Oreg.; Mex., C.Am.; W.I.

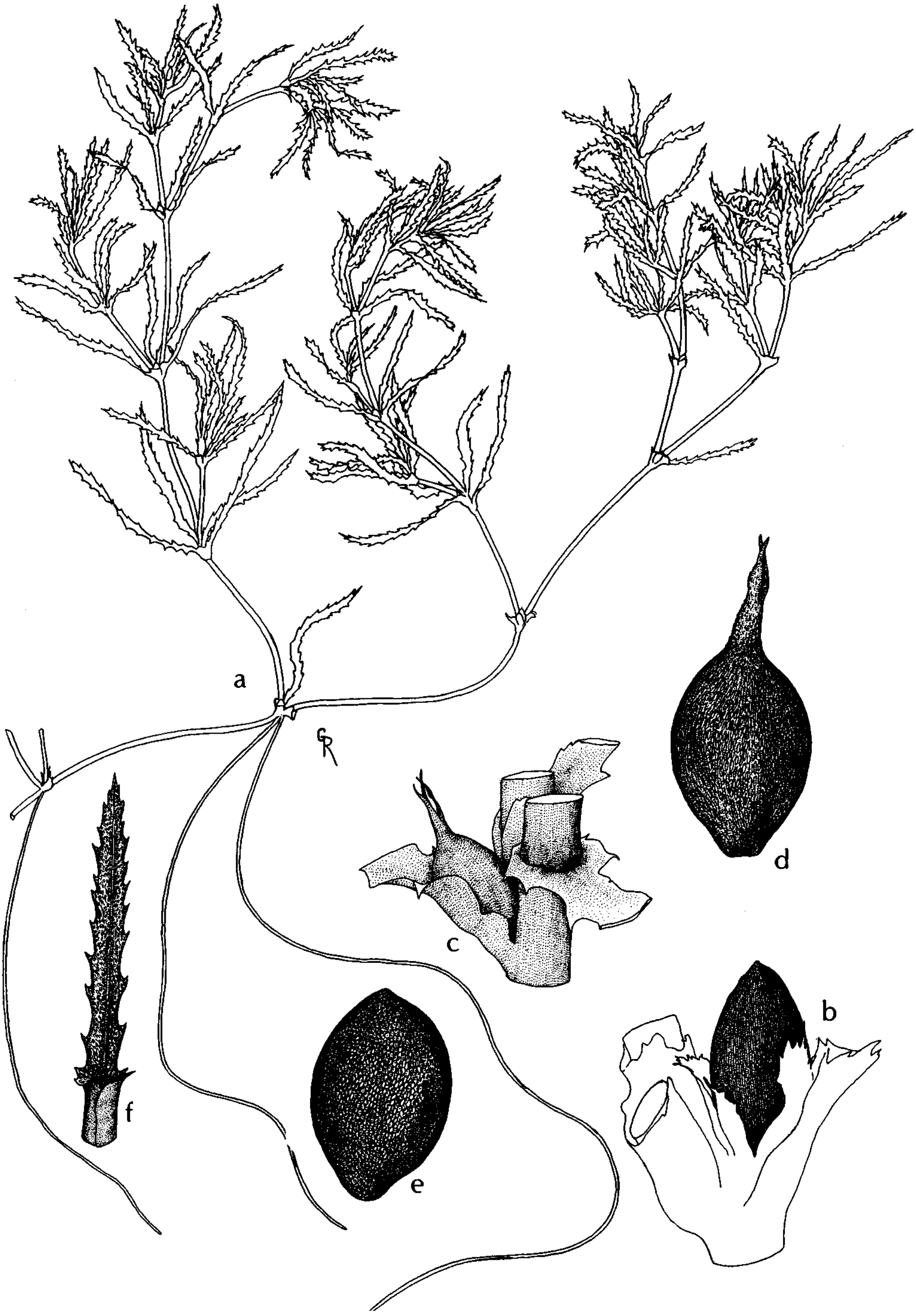

Fig. 16. **Najas marina:** a, habit; b, developing staminate spathe; c, pistillate flower; d, fruit; e, seed; f, leaf.

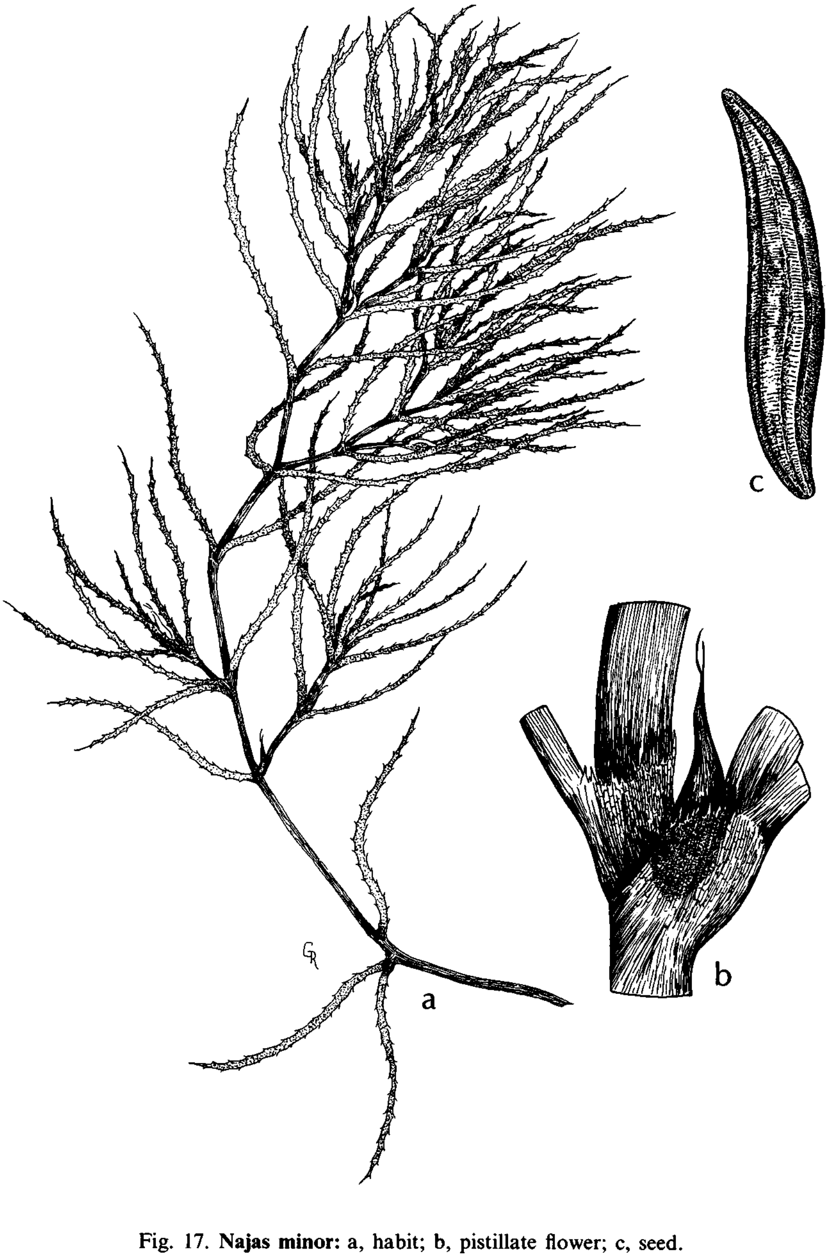

Fig. 17. **Najas minor:** a, habit; b, pistillate flower; c, seed.

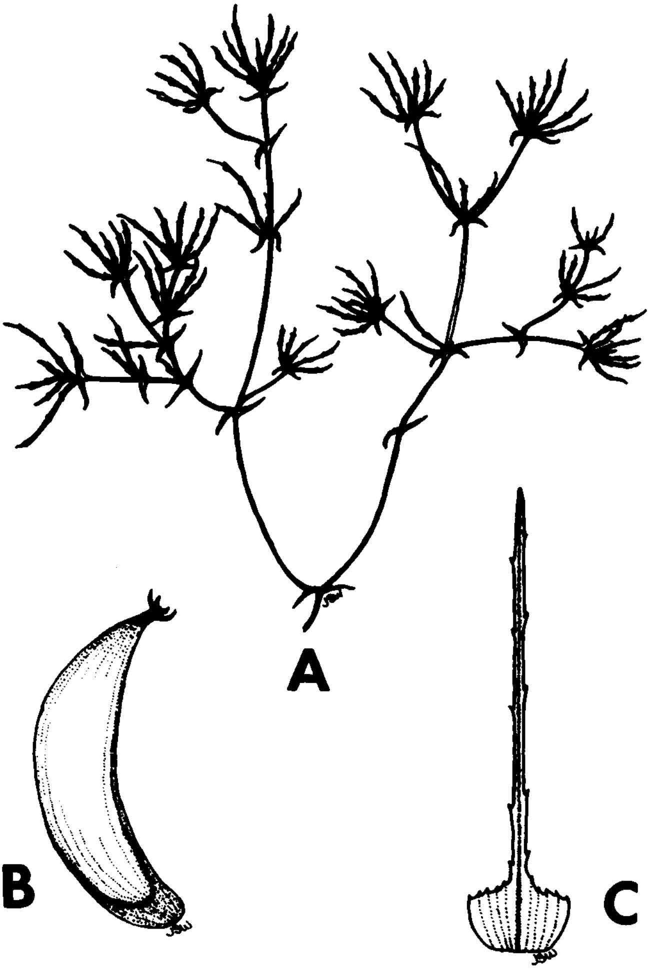

Fig. 18. **Najas ancistrocarpa:** A, habit; B, fruit with involucre; C, leaf. (From Haynes and Wentz in *Sida* 5: 260. 1974)

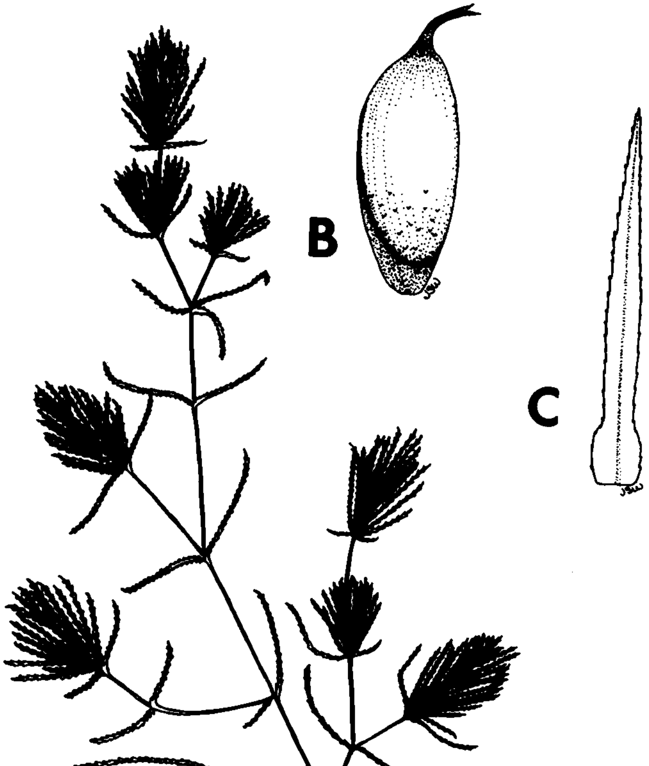

Fig. 19. **Najas wrightiana:** A, habit; B, fruit with involucre; C, leaf. (From Haynes and Wentz in *Sida* 5: 262. 1974)

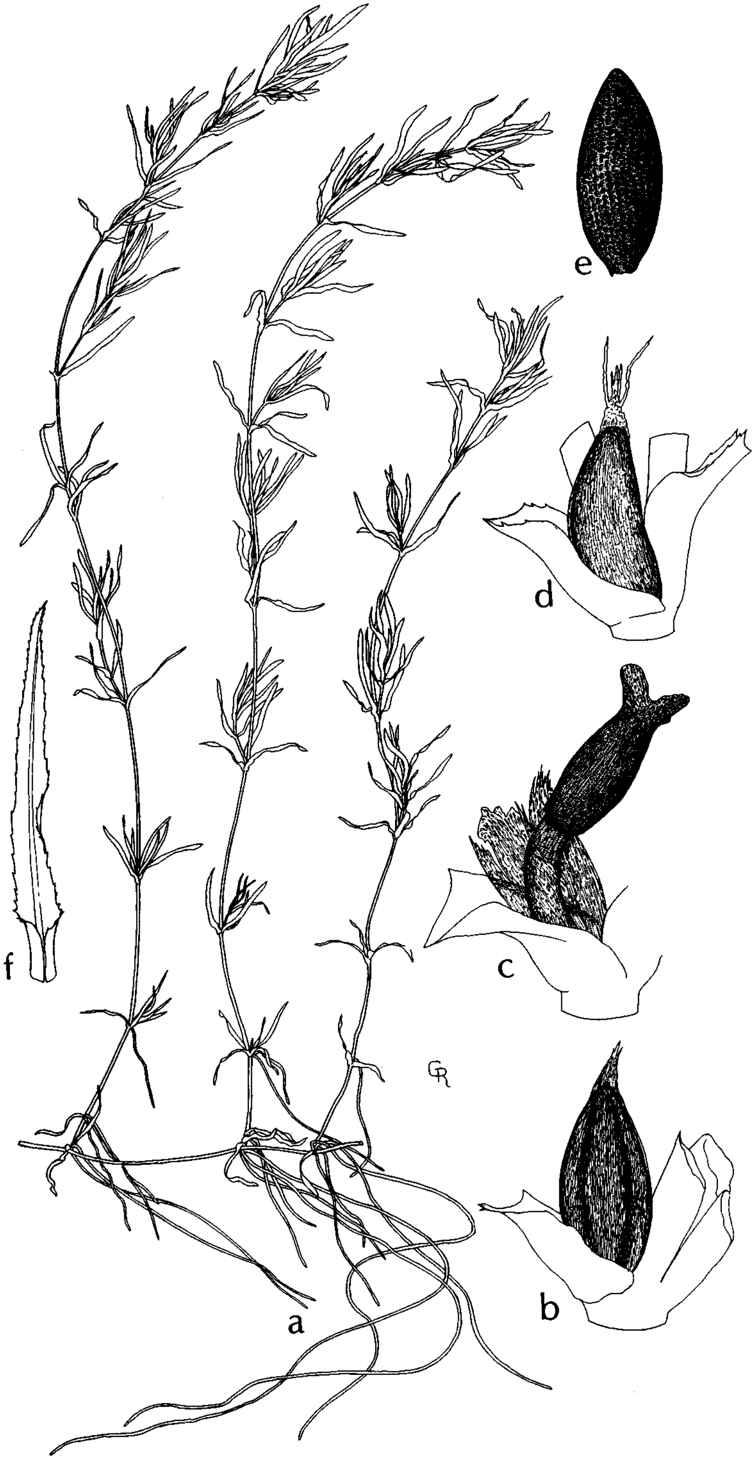

Fig. 20. **Najas guadalupensis:** a, habit; b, developing staminate spathe; c, staminate flower; d, pistillate flower; e, seed; f, leaf.

Juncaginaceae (ARROW-GRASS FAMILY)

Triglochin striata R. & P. ARROW-GRASS.

Perennial glabrous herb perennating by underground runners. Leaves basal, narrowly long-linear, fleshy, terete, sheathing at the base, 4–20 cm long, 0.5–1.5 mm wide. Inflorescence a long, narrow, bractless raceme, 4–19 cm long terminating a scape. Flowers bisexual on pedicels 1–1.5 mm long. Perianthlike segments 3, orbicular, green. Stamens 3, sessile in the axils of the perianthlike segments. Ovary superior, style none, stigmas 3, short-plumose. Fruit globose-triangular, splitting when dry into 3 follicles, each dehiscent on the inner side.

Saline or brackish marshes, coastal strands, edges of lakes, mostly near the coast. Md. to Fla. and La.; Calif. and Oreg.; trop. Am.; Afr. and Austl.

Alismataceae (WATER-PLANTAIN FAMILY)

1. Upper and lower (all) flowers of the inflorescence bisexual.
  2. Pistils arranged in a single circle on the receptacle; stamens usually 6. 1. *Alisma*
  2. Pistils densely packed over the surface of the receptacle; stamens 9 or more. 2. *Echinodorus*
1. Upper flowers of the inflorescence staminate, the lower pistillate (rarely all bisexual). 3. *Sagittaria*

1. Alisma

Alisma subcordatum Raf. WATER-PLANTAIN, MUD-PLANTAIN.

Leaves basal, long-petioled, blades ovate to elliptic, broadly cuneate to subcordate at base, abruptly tapered at the apex, to 12 cm long and 8 cm wide. Inflorescence to 6 dm tall, panicled, the branches whorled, inflorescence bracts lanceolate, acuminate apically, about 1 cm long. Flowers bisexual, numerous, slender-stalked. Sepals 3, green, persistent, broadly ovate to suborbicular, obtuse, 2–6 mm long. Petals 3, white or occasionally rose or pink, to 2.5 mm long. Pistils many in a single circle on a small flattened receptacle. Fruiting heads 4 mm wide or less. Achenes obliquely obovate, strongly flattened, about 2 mm long, with a minute ascending beak.

Shallow water, marshes, shores of ponds and streams, ditches. N.E. to Ont., N.Y., w. to Minn., Nebr., s. to Fla. and Tex.

2. Echinodorus (BURHEADS)

Annual or short-lived perennials. Leaves basal, usually erect, long-petioled. Scapes ridged or angled, erect (at least when young), longer than the leaves, in some becoming arched, decumbent distally, rooting at the nodes and proliferating. Flowers bisexual, arranged in 1–several umbellike whorls, stalked. Sepals 3, persistent. Petals 3, white. Stamens 9–25, filaments glabrous. Pistils numerous, densely packed over the surface of the receptacle, styles obliquely apical or lateral near the apex of the ovary. Achenes plump, ribbed or ridged. Seeds hairpin curved.

1. Plants diminutive, scapes usually less than 10 cm tall; leaves lance-linear; pistils less than 20; stamens 9; anthers basifixed. 1. *E. parvulus*
1. Plants much more robust, scapes usually much over 10 cm long; leaf blades usually ovate or broadly lanceolate, sometimes cordate; pistils many in dense heads; stamens 12–25; anthers versatile.
  2. Scapes rigidly erect at maturity; veins of the sepals smooth. 2. *E. rostratus*
  2. Scapes erect when young, arching and becoming repent with age; veins of the sepals papillose-ridged. 3. *E. cordifolius*

1. Echinodorus parvulus Engelm. DWARF BURHEAD. Fig. 21

Small plant, spreading by slender rhizomes, often forming dense mats. Leaf blade tapering below into the petiole, the blade lance-linear, 5–8 mm wide, thickly obtuse apically, midvein prominent beneath, usually 1 pair of nearly parallel lateral veins evident. Scapes erect, 5–10 cm long, slightly 3-angled but not obviously grooved, terminated by a whorl of 5 or 6 flowers. Flower stalks subtended by deltoid bracts, erect at anthesis, recurved in fruit, 1–2 cm long. Flowers about 6 mm across. Sepals broadly boat-shaped, about 2 mm long and wide, closely investing the fruit during much of its development. Petals minutely papillate on both surfaces, sparkling-shiny (under low magnification). Stamens 9, filaments about 0.5 mm long; anthers basifixed. Pistils usually about 17. Achenes reddish brown, with 8 ribs, 1 dorsal, 1 ventral, 6 lateral, all about the same size. Beak of the achene usually lateral. (*E. tenellus* (Mart.) Buch. var. *parvulus* (Engelm.) Fassett; *Helianthium parvulum* (Engelm.) Britt.)

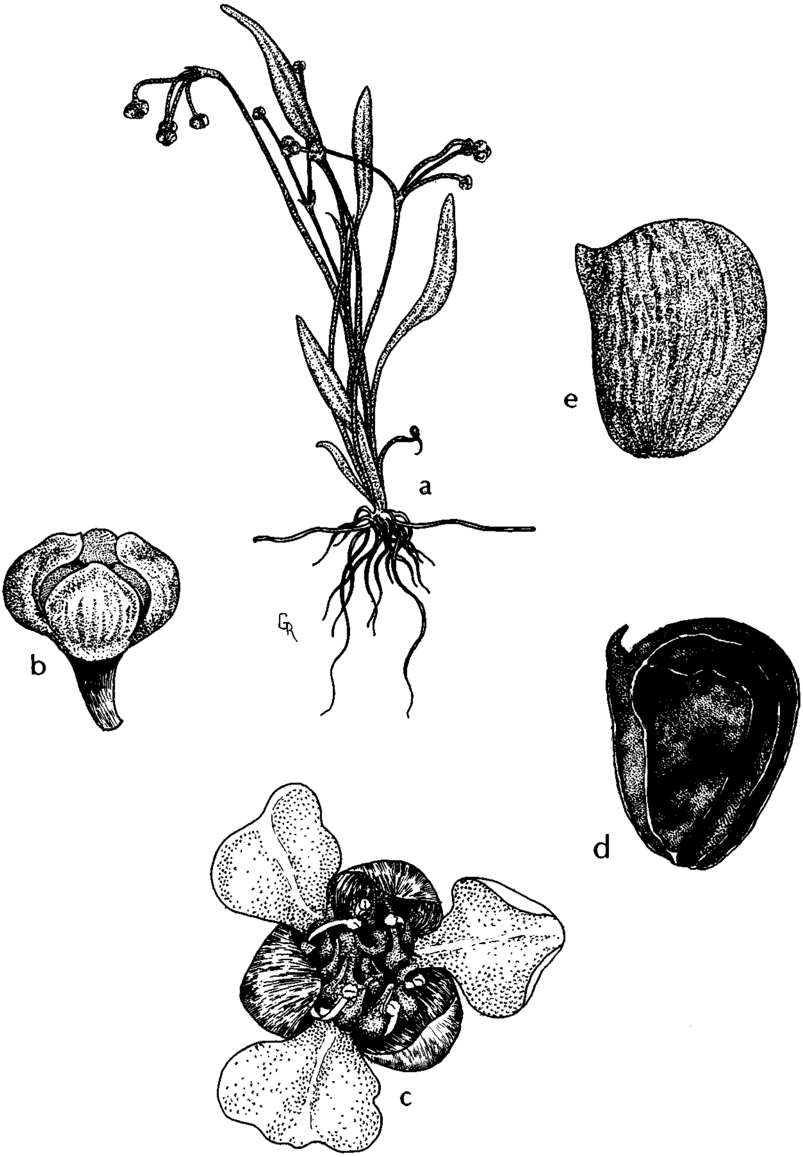

Fig. 21. **Echinodorus parvulus:** a, habit; b, bud; c, flower; d, achene; e, seed.

Pond margins, wet depressions in sandhills and flatwoods. Apparently local, manifesting itself only when conditions are favorable to its growth. Mass. to Ont., Minn., s. to cen. pen. Fla., and s. Tex.

2. **Echinodorus rostratus** (Nutt.) Engelm. ERECT BURHEAD. Fig. 22

Relatively robust plant, the erect scapes to 8 dm tall. Leaves very variable from seedling stage to mature plant; those of young plants with lax linear to lanceolate blades with winged petioles; later leaves rigidly erect, long-petioled, the blades broadly ovate, subcordate or truncate to broadly cuneate basally, apically obtuse to rounded, principal veins 8–10, arcuate, connected by nearly straight cross-veins, the blades to 15 cm long, often as broad; petioles spongy-enlarged below, tapering above. Scapes erect, prominently grooved, verticillately racemose to paniculate. Flowers about 1 cm across, in whorls of 3–9, whorls subtended by subulate bracts, flowers of a particular whorl at different stages of development at a given time. Sepals triangular-ovate to ovate. Stamens usually 12, anthers versatile. Pistils many, styles tapering. Achene prominently ribbed, style persistent as an obliquely erect beak ½ to ⅔ the length of the achene body, with 2 prominent glands below the beak on each side. Seed brown, lustrous, finely reticulate, about 1 mm long. (*E. berteroi* (Spreng.) Fassett as to descr.; E. *cordifolius* sensu Small)

Shallow ponds, shores, marshes, and ditches. Apparently very local, e. Del. to Ill., s. to Fla. and Tex.; Ont. to Calif.; Mex.

3. **Echinodorus cordifolius** (L.) Griseb. CREEPING BURHEAD. Fig. 23

Relatively robust annual or short-lived perennial. Leaves petioled, the petioles spongy-enlarged below, tapering above, 5–50 cm long, the abaxial side rounded, ridged and grooved; blades broadly ovate, 2–14 cm long, 0.8–11 cm wide, apically acute to rounded, broadly cuneate to truncate, or shallowly cordate at base, principal veins 7–9, arcuate, connected by nearly straight cross-veins. Scapes erect when young, soon arching and becoming repent, often producing plantlets at the nodes and tips, to at least 12 dm long, furrowed, often branched from the lowest node. Flowers 12–20 mm across, in whorls of 5–15, each subtended by a long-triangular bract, not all at the same stage of development at a given time. Sepals broadly boat-shaped, about 5 mm long and 3 mm wide, apices rounded, papillose ridged. Stamens 20–22, filaments glabrous, 2–3 mm long, anthers versatile. Pistils many, styles tapering, persistent as a short-oblique beak. Achene about 2 mm long, dorsal keel irregularly crested, 2–4 slightly elongated glands at about the middle on each side. Seed lustrous, finely reticulate.

Swamps, wet woodlands, shores, marshes, and ditches. Md. and Va. w. to Ill., Mo., s. to Fla. Panhandle and e. Tex.

3. Sagittaria (ARROWHEAD, WAPATO)

Aquatic or amphibious, frequently heterophyllous, mostly perennial, sometimes rhizomatous, the rhizomes often bearing corms at their extremities, some with milky sap. Leaves emersed, floating, or submersed (in some species leaves of all three foregoing types present on a given plant), in some leaves all bladeless (phyllodial), in some both phyllodial and bladed, in some all bladed; blades if present, unlobed in some, sagittate to hastate in some, or both at certain stages of development. Scapes sheathed basally by the petiole bases, erect, laxly ascending, in some submersed aquatics flexuous, lax and trailing, the floriferous tips partly or wholly emersed-floating. Flowers mostly in whorls of 3 on a raceme, sometimes paniculate, mostly unisexual (rarely bisexual), usually the staminate uppermost in the inflorescence, pistillate below; subtended by membranous to firm bracts. Sepals 3, green, persistent, in fruit appressed, loosely ascending, or reflexed. Petals 3, white (rarely pinkish), or white with a red, purple, or green spot at the base, usually larger than the sepals, rather quickly deciduous. Stamens usually numerous, filaments linear or dilated basally. Pistils numerous, spirally arranged and crowded on a

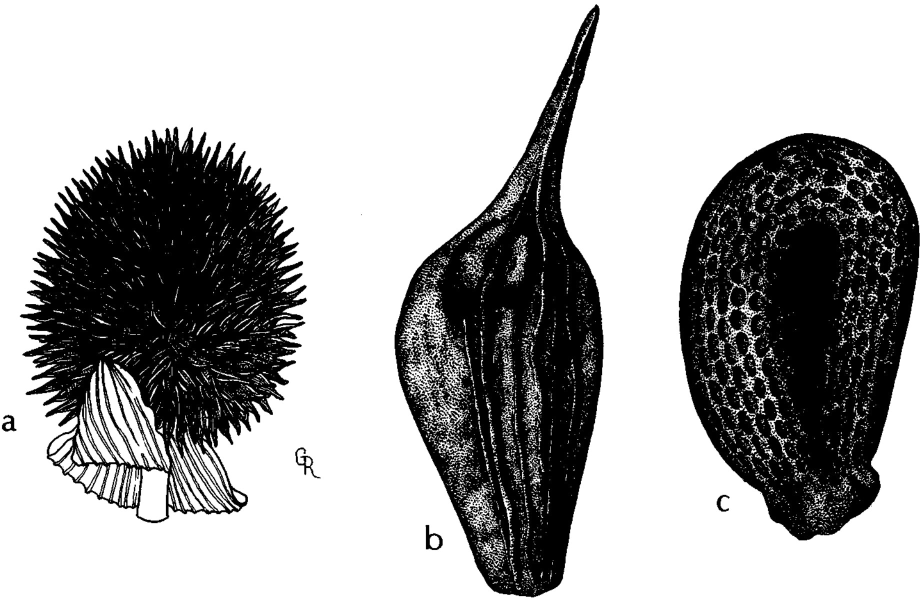

Fig. 22. **Echinodorus rostratus:** a, head of achenes; b, achene; c, seed.

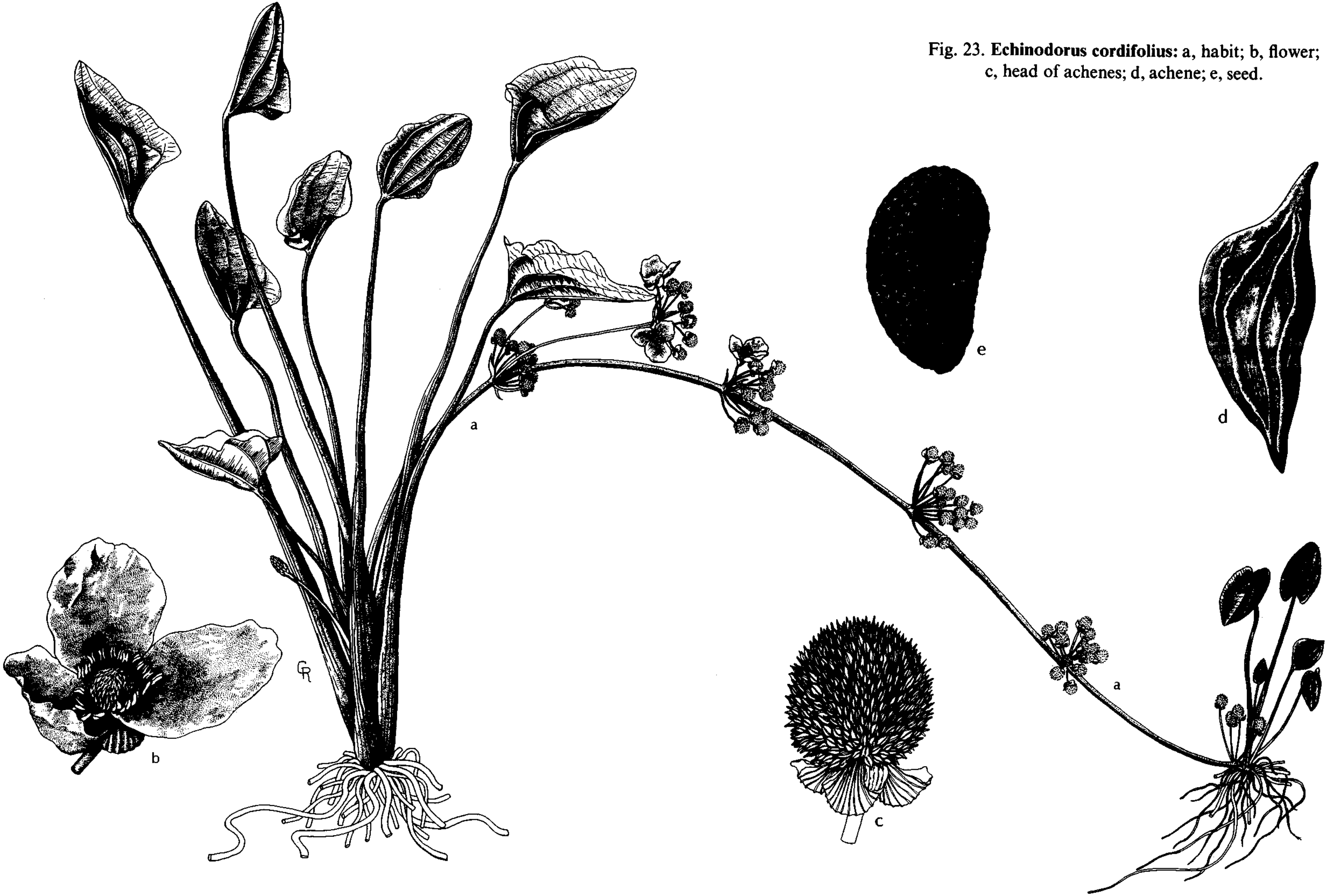

Fig. 23. **Echinodorus cordifolius:** a, habit; b, flower; c, head of achenes; d, achene; e, seed.

domelike receptacle, forming globose or subglobose fruiting heads. Achenes flattened, winged, with erect to lateral beaks, the beaks sometimes minute.

1. Blades of mature leaves deeply cordate and floating, or with sagittate or hastate basal lobes (in *S. stagnorum*, if growing emersed, some, usually not all, leaves hastate or sagittate and not usually conspicuously so).
  2. Leaf blades floating, deeply cordate; petals with a dull red spot at the base on the upper surface. 1. *S. guayanensis*
  2. Leaf blades sagittate or hastate at base.
    3. Petals with a purple or green spot at the base on the upper surface; filaments pubescent. 2. *S. montevidensis*
    3. Petals completely white; filaments glabrous.
      4. Stalks of the fruiting heads recurved. 7. *S. stagnorum*
      4. Stalks of the fruiting heads ascending or spreading.
        5. Bracts of the inflorescence obtuse or nearly so, much shorter than the flower stalks, beak of the achene projecting at right angles from the body. 3. *S. latifolia*
        5. Bracts of the inflorescence acuminate to acute, nearly as long as to exceeding the flower stalks; beak of the achene obliquely ascending to recurved. 4. *S. engelmanniana*
1. Blades of mature leaves without basal lobes, *or* leaves bladeless phyllodia.
  6. Stalks of fruiting heads recurved.
    7. Plant with some (at maturity usually all) erect emersed leaves, the blades lanceolate, elliptic or ovate. 8. *S. platyphylla*
    7. Plant submersed with all phyllodial leaves, or with some phyllodial and some bladed floating leaves, or, in tidal waters, emersed and submersed with changing tides, all leaves phyllodial (rarely on muddy banks, above high tide marks and emersed, with tips of the phyllodia somewhat dilated).
      8. (Note: 3 choices numbered 8). Plants submersed, with elongate straplike or ribbonlike phyllodia 1–3 m long or thereabouts; phyllodia prominently 1–5 ridged-veined on the lower surface; plants of large springs and spring-fed streams, fresh to somewhat brackish. 5. *S. kurziana*
      8. Plants mostly in tidal muds, for the most part submersed and emersed alternately with the changing tides; leaves phyllodial, thickish and stiffish, not ridged-veined, mostly 0.5–1.0 dm long and 3–8 mm wide (longer, to 3 dm, and wider, to about 2 cm, and flexuous when growing where rarely emersed at low tide); in strongly brackish to fresh tidal waters. 6. *S. subulata*
      8. Plants largely submersed, with both narrow and flexuous phyllodial leaves and long-petioled, floating, bladed leaves (sometimes only one or the other); plants of fresh waters, ponds, lakes, swamps, drainage ditches and canals. 7. *S. stagnorum*
  6. Stalks of fruiting heads ascending or spreading, not recurved.
    9. Filaments linear.
      10. Leaves essentially phyllodial, enlarged-spongy at the base, tapering distally to linear or narrowly lanceolate "blades"; filaments usually glabrous. 9. *S. papillosa*
      10. Leaves long-petioled, the blades definite, elliptic to lanceolate, rarely ovate; filaments cobwebby-pubescent. 10. *S. lancifolia*
    9. Filaments dilated at the base.
      11. Bracts of the inflorescence somewhat united, their free tips to 15 mm long; phyllodial leaves, if present, broadly straplike; stamens 2 mm long or more. 11. *S. graminea*
      11. Bracts of the inflorescence about wholly united, their free tips minute; leaves phyllodial, narrowly straplike, flattened dorsally to almost terete; stamens 1.5 mm long or less. 12. *S. isoetiformis*

1. **Sagittaria guyanensis** HBK.

Perennial, glabrous or pubescent. Submersed leaves phyllodial. Most leaves floating, long-petiolate, the petioles lax, 10–40 cm long, blades ovate or elliptic, deeply cordate basally, rounded or obtuse apically, variable in size, to 7 cm long and as broad. Scape erect, its flowering summit emersed, the lower whorls of flowers sometimes under water, flowers in racemes of 2–5 whorls. Inflorescence bracts united at the base, submembranous. Flowers having pistils with a ring of functional stamens, their stalks 1.5–4.0 cm long, recurved. Sepals triangular, 10–15 mm long, strongly keeled distally, appressed to the fruiting head at its maturity. Petals oblong, 12–15 mm long, white with a dull red spot on the upper surface near the base. Filaments linear, glandular or glabrous. Fruiting heads a little over 1 cm across. Achenes plump, strongly tuberculate or echinate-winged; beak 0.3–0.8 mm long, laterally-obliquely inserted.

The subsp. *guyanensis* native in much of tropical America. Naturalized in rice fields, La. Subsp. *lappula* (D. Don) Bogin occurs in Old World Tropics.

2. Sagittaria montevidensis Cham. & Schlecht. GIANT ARROWHEAD. Fig. 24

Relatively coarse annual, the early stages usually submersed and leaves phyllodial. Leaves of mature plant with stout spongy petioles, the blades broadly ovate, sagittate basally, apically broadly obtuse, to 2 dm long or more and as wide. Scape erect, racemose, or branched at the lowest node, whorls of flowers vary in number, up to about 12. Bracts about 1 cm long, ovate, acute to attenuate apically. Flowers having pistils with a ring of functional stamens, or wholly pistillate. Sepals ovate-orbicular, markedly concave, 12–14 mm long, in fruit mostly appressed and embracing the fruiting head. Petals somewhat longer than the sepals, white with a purple or green spot on the upper surface at the base. Stamens with linear pubescent filaments. Fruiting heads 2 cm across. Achenes cuneate-obovate, narrowly winged, the beak positioned horizontally or obliquely.

Plants with flowers having pistils and lacking a ring of functional stamens, the petals with a purple spot at the base, are segregated as subsp. *montevidensis.* Native to S.Am., adventive sporadically, in our range mostly near a few seaports, perhaps not persisting.

Plants with flowers having pistils with a ring of functional stamens, the petals with a green spot at the base, are segregated as subsp. *calycina* (Engelm.) Bogin (*S. calycina* Engelm., *Lophotocarpus calycinus* (Engelm.) J. G. Sm.). Swamps, ponds, lakes, sloughs, drainage and irrigation ditches. Ohio to N. Dak., s. to Va., Ala., Tex., N.Mex., Calif.

Plants of the subsp. *montevidensis* are generally much coarser, more robust, than are those of the subsp. *calycina.*

3. Sagittaria latifolia Willd. WAPATO, COMMON ARROWHEAD, DUCK-POTATO. Fig. 25

Erect, relatively coarse, aquatic or subaquatic, glabrous or pubescent, overwintering by corms borne terminally on slender rhizomes. Leaves long-petioled, the petioles spongy-inflated below, to 10 dm long; blades essentially 3-lobed, a terminal lobe and sagittate to hastate basal lobes, very variable as to overall size, size and shape of the 3 lobes and orientation of the basal ones; the basal lobes about as long as, even longer than, the terminal one, nearly parallel to widely divergent; lobes from nearly linear to broadly ovate-triangular, their apices broadly obtuse to narrowly acute or acuminate; juvenile and submersed leaves phyllodial, straplike, usually rotted away and rarely seen on adult plants. Scapes erect, somewhat shorter to a little longer than the leaves, to about 8 dm tall, the flowers in racemes, in up to about 10 whorls, rarely branched from the lowest node. Flower stalks ascending or spreading, those of the lower flowers longer. Sepals about 1 cm long, glabrous to densely pubescent, reflexed on the fruiting heads. Petals white, as broad as long or broader, about 2.5 cm, very broadly rounded at the summit. Fruit heads to 2.5 cm across. Achenes cuneate-obovate in outline, broadly corky-winged, 2.5–3.5 mm long, 1.5–2.5 mm wide, the beak tapered, horizontal to incurved.

Plants glabrous throughout are segregated as var. *latifolia.* (Incl. var. *obtusa* (Muhl. ex Willd.) Wieg.)

Wet meadows, marshes, marshy shores, wet woodlands and swales, sloughs and ditches. N.S. and N.E. to B.C., generally s. in the U.S.; Mex.; tropics and subtropics of both hemispheres.

Pubescent plants are segregated as var. *pubescens* (Muhl.) J. G. Sm. (*S. pubescens* Muhl.; incl. *S. ornithorhyncha* Small). Similar habitats to those occupied by var. *latifolia.* Pa. to Ohio; s. to Fla. and Tex.

4. Sagittaria engelmanniana J. G. Sm.

Plants erect, aquatic or subaquatic, perennating by corms formed at the ends of slender

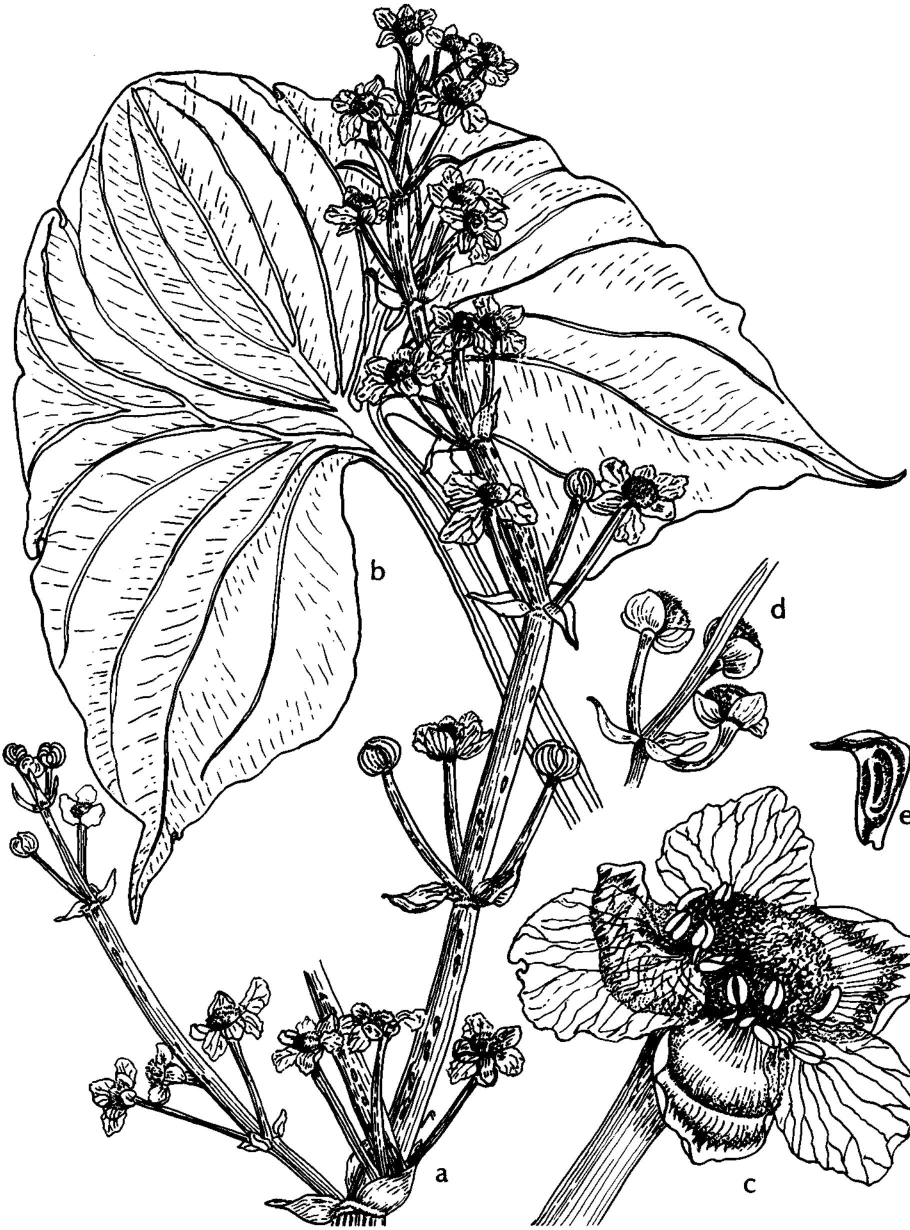

Fig. 24. **Sagittaria montevidensis:** a, inflorescence; b, leaf; c, flower; d, whorl of fruiting heads; e, achene. (From Correll and Correll)

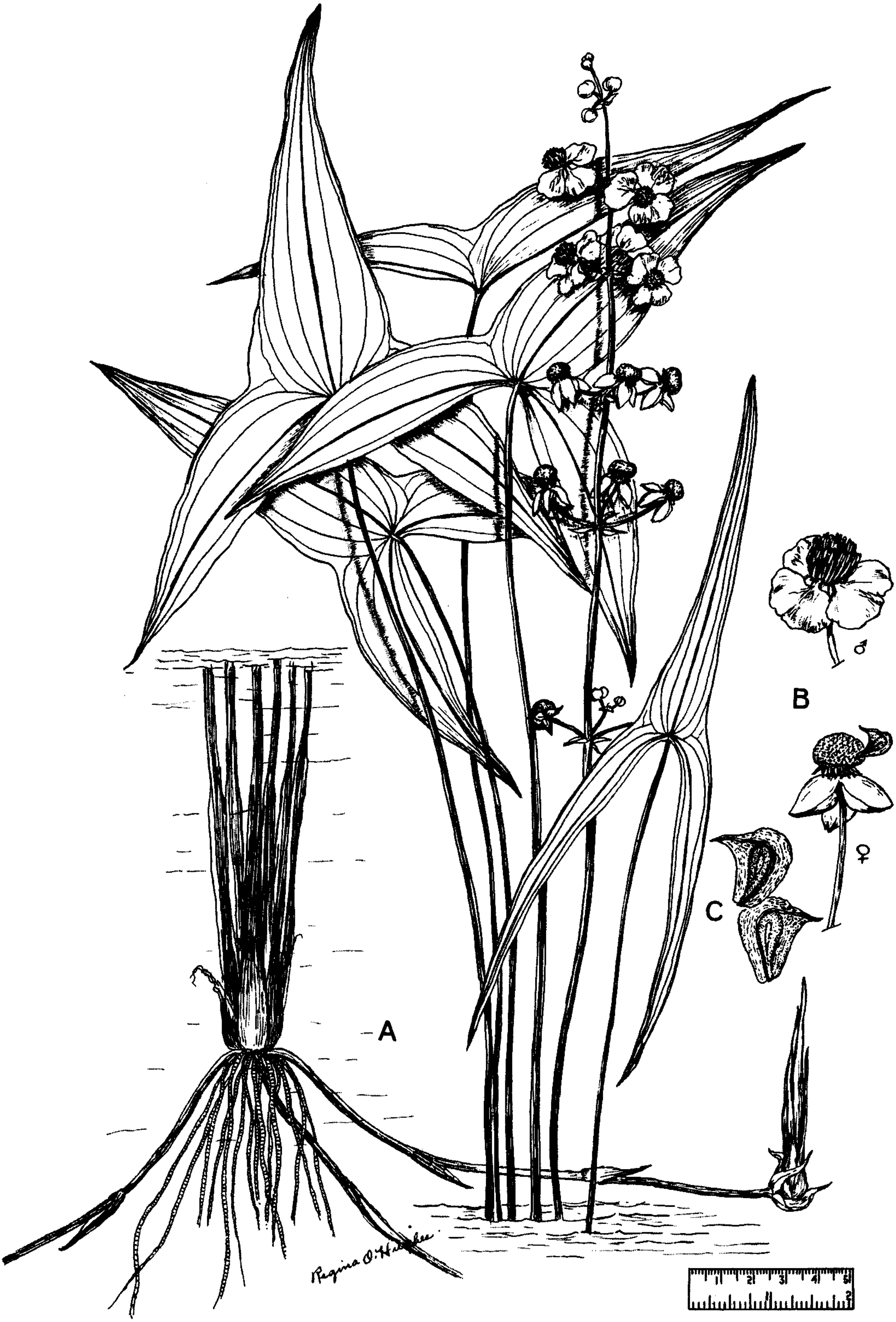

Fig. 25. **Sagittaria latifolia:** A, habit; B, staminate and pistillate flowers; C, achenes.
(From Reed, *Selected Weeds of the United States* (1970) Fig. 12)

rhizomes. Leaves variable in size and shape; juvenile leaves phyllodial, straplike, usually rotted away and not seen on mature plants; early-formed emersed leaves long-petioled, the blades linear-elliptic to oval, without basal lobes; later leaves, those usually seen, long-petioled, to 6 dm, the blades sagittate, 7–25 cm long, 2–11 cm wide, the basal lobes about as long as, or slightly longer than, the terminal one, somewhat divergent to widely divergent. Scapes erect, shorter than to somewhat longer than the leaves, 3–8 dm tall, the lower racemose, in 3–12 whorls, occasionally branched from the lowest node, flower stalks ascending. Bracts of the inflorescence linear to lanceolate, acute to acuminate apically, their margins scarious, shorter than to equalling or exceeding the flower stalks. Sepals short-ovate, acute, 4–7 mm long, reflexed on the fruiting heads. Petals white, 8–15 mm long. Filaments slender, glabrous. Fruiting heads 1–2.5 cm across, their receptacles markedly echinate (in ours). Achenes obovate or cuneate-obovate, 3–4.5 mm long, 2–3.5 mm wide, the margins broadly corky-winged, the faces with 1–3 wings, beak obliquely ascending to recurved, 1–2 mm long.

Usually in shallow water, marshes, shores, swamps, bogs, ditches.

In our range, comprised of two intergrading subspecies: (1) Plants with bracts shorter than the flower stalks; scapes with 2–4 whorls of flowers; beaks of the achenes obliquely ascending; subsp. *engelmanniana*. Usually in acid waters. Mass. to S.C. (2) Plants with bracts equalling or exceeding the flower stalks; scape with 5–12 whorls of flowers; beak of the achene recurved; subsp. *longirostra* (Micheli) Bogin (*S. longirostra* (Micheli) J. G. Sm.; incl. *S. australis* (J. G. Sm.) Small). N.Y. to Ind., s. to n. Fla. and Miss.

5. Sagittaria kurziana Glück. SPRING-TAPE. Fig. 26

Submersed aquatic, rhizomatous and producing corms on the rhizomes, forming vast stands in certain large springs and the streams issuing from them. Leaves all phyllodial, to 2.5 m long and 1.4 cm wide, flat and essentially linear and straplike or ribbonlike with several, usually 3–5, elevated veins, sometimes only a midvein on the lower surface, usually slightly broader above the middle, tapering gradually to the tip, the margins revolute. Scape about as long as, or slightly longer than the phyllodes, lax and flexuous with 4–10 whorls of flowers terminally, usually only the lowermost whorl pistillate, the inflorescence usually about at the water surface, buds buoyant just before anthesis, the open flowers held just above the water surface. Stalks of pistillate flowers recurved in fruit. Flowering occurs throughout the year. Developing inflorescence enclosed in a floral envelope. As growth occurs the envelope is split down one side nearly to the base giving a spathelike appearance. Other tears of the envelope often occur producing a 3-parted "bract" structure which soon disintegrates leaving a ring of chlorophyllous tissue at the node. (The feature described above is characteristic of *S. subulata* and *S. stagnorum* as well.) Sepals loosely appressed to the fruiting head. Petals white, 9–14 mm long, 4–8 mm wide. Filaments somewhat dilated below, glabrous. Fruiting heads about 8–10 mm across. Achene with 5 lateral crests, deeply indented between them, the short beak erect to inclined, inserted obliquely at about the summit. (*S. subulata* subsp. *kurziana* (Glück) Bogin)

In large springs and streams issuing from them, in fresh to only slightly brackish water, n. and cen. pen. Fla. Reported from Agana Springs, Guam!

At spring heads during extended periods of drought and consequent low water levels, plants of this species may be "stranded" in muck at which time their phyllodes are relatively short and may be dilated at their tips, not really forming distinct blades. We have observed phyllodes with similarly dilated tips on plants growing in deep water a few times.

We have noted that plants of what we take to be this species vary considerably in certain attributes of the phyllodes from one spring or spring-fed stream to another. Since vegetative reproduction appears to be predominant, it is impossible to discern in any given body of water the extent of a given clone. This naturally poses problems in seeking information about variability.

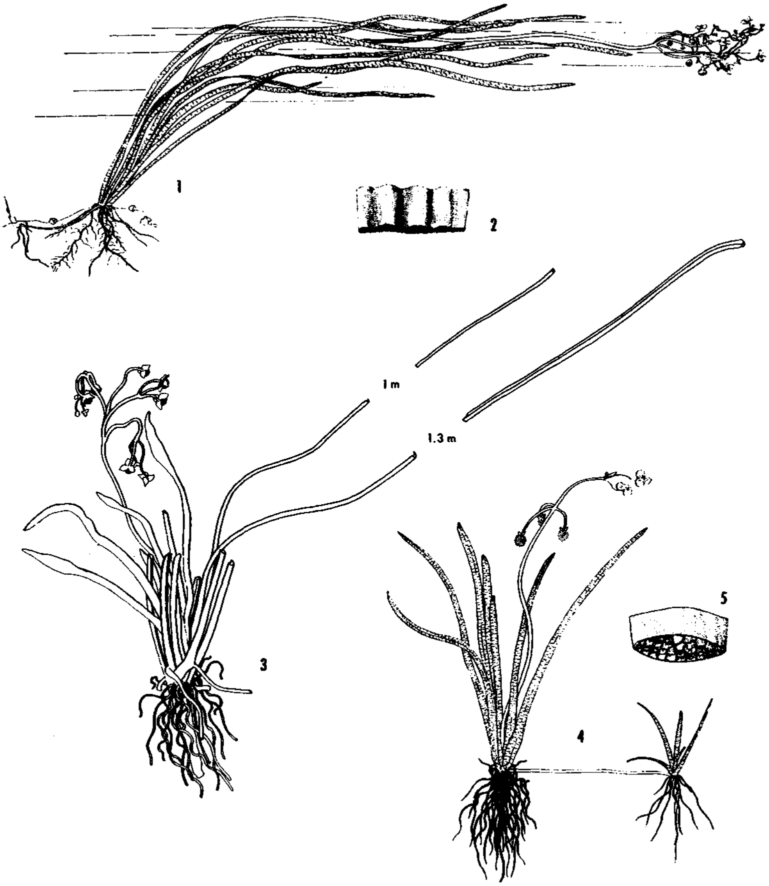

Fig. 26. **Sagittaria kurziana:** 1, habit; 2, small section of phyllode; 3, (drawn from) uprooted and floating plant; 4–5 **Sagittaria subulata:** 4, habit; 5, small section of phyllode. (From Adams and Godfrey in *Rhodora* 63: 250. 1961)

6. Sagittaria subulata (L.) Buch. Fig. 26

Small perennial, rhizomatous, corms forming on the rhizomes (as many as 50 on a single rhizome have been observed), frequently forming dense sodlike masses; mostly in tidal waters, submersed at high tide, emersed at low, the extent of submersion and emersion at any given time and place depending upon the particular tide. Leaves all phyllodial, linear-subulate, thickish, 2–30 cm long, 3–8 mm wide, apices mostly obtuse, lenticular in cross-section, often ⅔ to ¾ as thick as wide (pressing flat), veins obscure. Scapes semi-lax, erect to repent, mostly 6–40 cm high, with 2–8 whorls of flowers in a raceme. Sepals loosely appressed to the fruiting heads. Petals white, 4–8 mm long and 4–8 mm wide. Stalks of the pistillate flowers stoutish, reflexed in fruit. Filaments slender, glabrous. Achene obovate, about 1.5–2.0 mm long, wing-margined, the faces slenderly keeled, beak short, 0.3–0.4 mm long, oblique, erect, or horizontal, sometimes hooked at the tip. (*S. lorata* (Chapm.) Small)

Tidal shores, tidal marshes and sloughs, in fresh to strongly brackish water. Mass. to Fla. and Ala.

7. Sagittaria stagnorum Small. Fig. 27

Small aquatic or amphibious plant with slender rhizomes, corms forming on the rhizomes, ofttimes so abundant in a pond or swamp that, from a little distance at flowering time, the surface of the water appears as if heavily strewn with confetti. Leaves very variable: in deeper water usually all phyllodial, flat, narrowly straplike or ribbon-like, thin and flexuous; in somewhat shallower water some of the phyllodes narrower below and dilated at the summit, the dilated portions linear to linear-elliptic; in still shallower water, the leaves with slender, very flexuous petioles and with definite floating blades, the blades mostly elliptic, oval, or ovate, the latter sometimes subcordate basally; in mud or muck on shore, or where plants are "stranded" as water levels recede, the leaves with stiffish petioles, spongy at base, tapering distally, ascending to erect, the blades very variable, some weakly, often irregularly, hastate to sagittate basally. Scapes of submersed plants slender and lax, the flowering tips more or less floating, with 2–6 rather remote whorls of flowers, the lowest whorl pistillate; buoyant buds bring whorls of flowers to the surface, a whorl at a time, the lower part of the inflorescence submerging as whorls come into bloom distally; open flowers are barely above water surface. Filaments slender, glabrous. Achene about 1.5 mm long, obovate, the faces somewhat keeled, beak short, horizontal to erect. (Incl. *S. subulata* var. *gracillima* (S. Wats.) J. G. Sm.)

Ponds, lakes, ephemeral streams, drainage canals, swamps, disappearing as the habitat dessicates during drought periods, sometimes reappearing again as conditions become favorable. Coastal plain, (Mass.?) to Fla. and Ala.

It is not unlikely that further study may reveal *S. filiformis* J. G. Sm. to be identifiable with this heteromorphic plant. If this were to be the case, the name *S. filiformis* has priority.

8. Sagittaria platyphylla (Engelm.) J. G. Sm.

Erect, glabrous perennial with slender, soft, sometimes very long, rhizomes. Leaves erect, rather variable in size and shape; emersed ones with lanceolate, elliptic, ovate, or lanceolate blades 8–20 cm long and 2–8 cm wide, unlobed, (occasionally with lateral projection(s) from the base), the petioles long, to 6 dm, relatively stout on the larger leaves; juvenile and submersed leaves phyllodial, straplike, to at least 25 cm long and 1.5 cm wide, usually rotted away and rarely seen on mature plants. Scapes unbranched, erect but weak, usually overtopped by the leaves, becoming 7–8 dm tall, with 3–8 whorls of flowers. Bracts ovate, scarious, fused much of their length, 3–8 mm long, the free ends obtuse. Stalks of pistillate flowers recurved in fruit, 1–3 cm long. Sepals reflexed in fruit, 4–6 mm long. Filaments dilated, pubescent, about 1 mm long, as long as or slightly longer than the anthers. Fruiting heads to 1.5 cm across. Achene cuneate-obovate, about 2 mm long and 1 mm wide, the dorsal wing rounded, faces with 1, rarely 2 or 3, slender

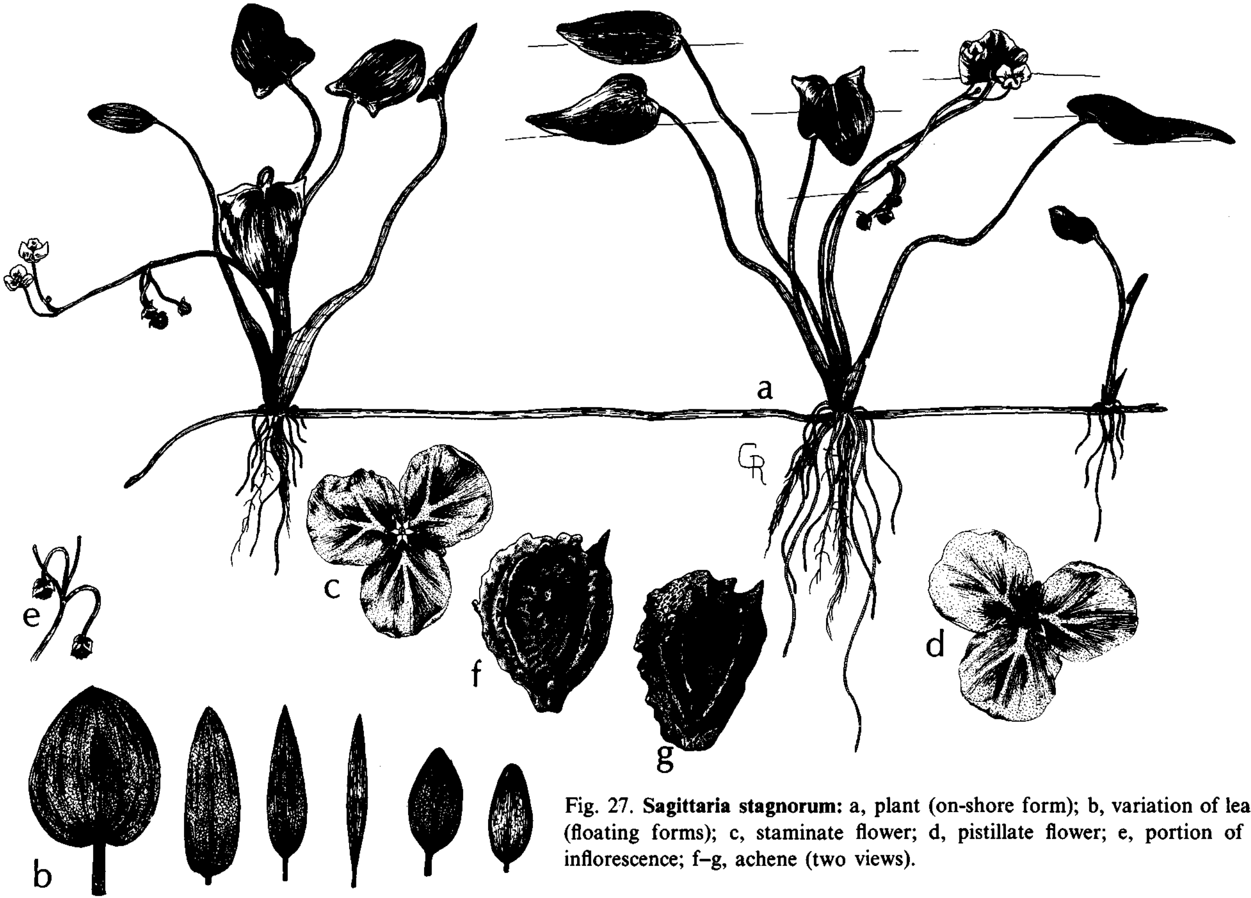

Fig. 27. **Sagittaria stagnorum:** a, plant (on-shore form); b, variation of leaf blades (floating forms); c, staminate flower; d, pistillate flower; e, portion of fruiting inflorescence; f–g, achene (two views).

ridges, beak subulate, about 0.5 mm long, obliquely ascending to horizontal. (*S. graminea* var. *platyphylla* Engelm; *S. mohrii* J. G. Sm.)

In mud or shallow water, ponds, marshes, shores, swamps, sloughs. Mo., Kans., s. to Ala., and e. Tex.

9. Sagittaria papillosa Buch. Fig. 28

Perennial with short thick rhizomes, the latter often covered with remnants of old leaf bases. Leaves essentially phyllodial, with short to longish, spongy-enlarged bases, tapering distally. Scape erect, 3–9 dm tall, usually branching from the lowest node, otherwise racemose. Bracts of the inflorescence ovate, somewhat united below, densely papillose, 0.3–0.7 mm long. Flower stalks ascending. Sepals 4–6 mm long, somewhat papillose, reflexed. Petals white, about twice as long as the sepals. Filaments linear, glabrous, about equalling the subglobose anthers. Fruiting heads about 1 cm across. Achene cuneate to more or less oblong, from about 1 to 1.5 mm long and 1 mm wide, narrowly winged; beak short, broad-based, lateral, about ⅓ below the summit of the achene.

Bogs, marshes, swamps, small ponds and depressions, ditches. Ark., La., Okla., e. and s.e. Tex.

10. Sagittaria lancifolia L. Fig. 29

Robust amphibious perennial, with coarse stout rhizomes. Leaves rather variable in size but commonly some very large ones on a given mature plant; borne on very stout spongy petioles to 8 dm long or more, blades broadly elliptic, oblong-elliptic, lance-elliptic, to 4 dm long and 1 dm wide, unlobed; juvenile leaves phyllodial, erect, nearly terete, not usually, if ever, present on mature plants. Scape erect, overtopping the leaves, to 1.5 m tall, frequently branched from the lowest whorl of flowers, the principal axis with as many as 10 whorls, the lower 3–4 usually pistillate, their fruiting stalks ascending, stouter and shorter than those of the staminate flowers. Bracts of the inflorescence firm, ovate-acuminate, striate to papillose, to 3.5 cm long. Sepals reflexed in fruit, striate to papillose, 5–10 mm long, ovate, acute to acuminate apically. Petals white, about twice as long as the sepals. Stamens very numerous, filaments linear, pubescent, 3–5 mm long, anthers oblong, 1.5–2.5 mm long. Fruiting heads about 1.5 cm across. Achene cuneate-oblanceolate, somewhat falcate, 1.8–2.2 mm long, the dorsal wing well developed, about 3–4 times as wide as the slight ventral wing, faces not ridged or with 1–3 low ones, beak thick-based, obliquely inserted.

Marshy shores of streams, rivers, and estuaries, often in fairly deep water, marshes, sloughs, drainage and irrigation ditches and canals, swamps, marshy shores of ponds and lakes. Coastal plain, Del. and Md.; s. to s. Fla., w. to s.e. Tex. and Okla.; trop. Am.

Plants with bracts and sepals striate-ribbed may be segregated as subsp. *lancifolia;* those with bracts and sepals more or less papillose may be segregated as subsp. *media* (Micheli) Bogin. (*S. falcata* Pursh)

11. Sagittaria graminea Michx. Figs. 29 and 30

Plants usually developing rather stout short rhizomes, but these not yet formed on many plants at anthesis, presumably in the first year from seed. Juvenile and early-formed leaves phyllodial; or older plants with the first early-season leaves, phyllodial, the plants having been emersed until and after growth of the season commenced, later-formed leaves emersed distally, petiolate and bladed; plants overwintering in wet places but not covered with surface water, usually forming bladed leaves, but no phyllodes after growth commences; blades linear, linear-lanceolate, to elliptic, phyllodes variable in length and width, from a few cm long to 50 cm long, from less than 1 cm wide to 2.5 (–3) cm wide. Scape unbranched or branched from the lowest whorl of flowers, the whorls 2–12, the lower 1–2 whorls pistillate (rarely all whorls staminate), the flower stalks spreading or ascending. Bracts of the inflorescence essentially free to united more than ½ way from the base. Sepals reflexed in fruit. Filaments broadly dilated, pubescent. Fruiting heads

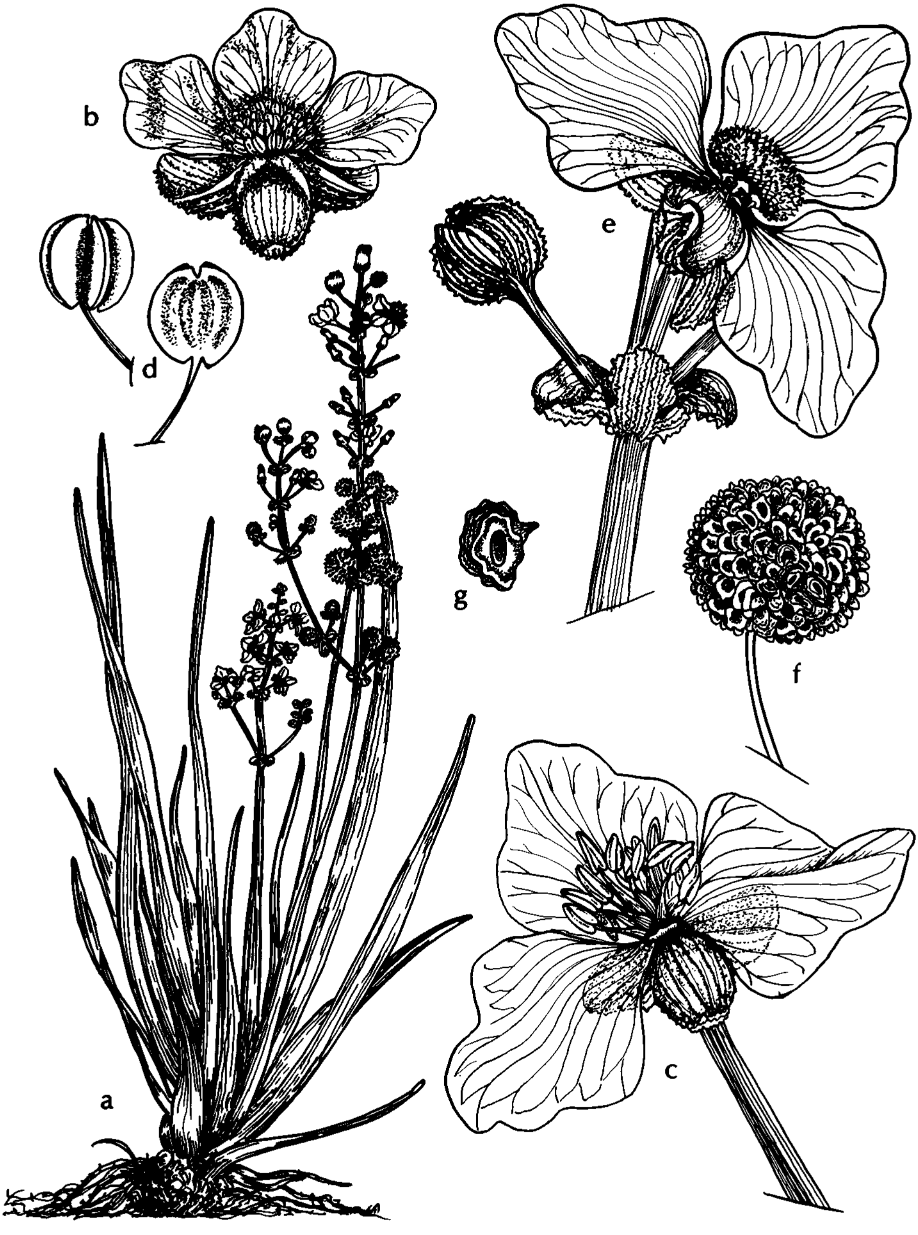

Fig. 28. **Sagittaria papillosa:** a, habit; b, c, staminate flowers; d, stamen (two views); e, pistillate flower; f, fruiting head; g, achene. (From Correll and Correll)

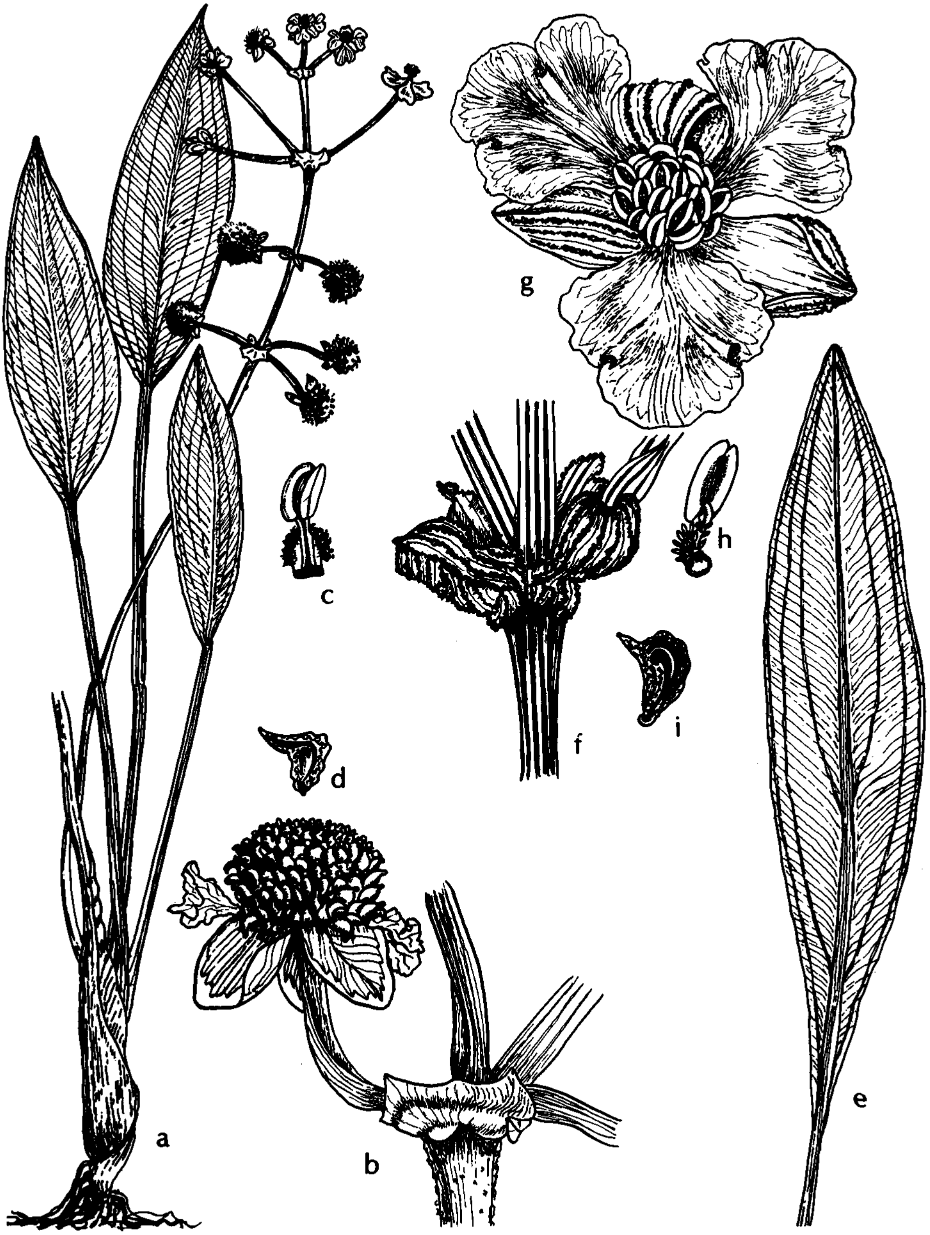

Fig. 29. a–d, **Sagittaria graminea:** a, habit of plant having grown wholly emersed; b, fruiting head; c, stamen; d, achene; e–i, **Sagittaria lancifolia:** e, leaf blade; f, bracts; g, staminate flower; h, stamen; i, achene. (From Correll and Correll)

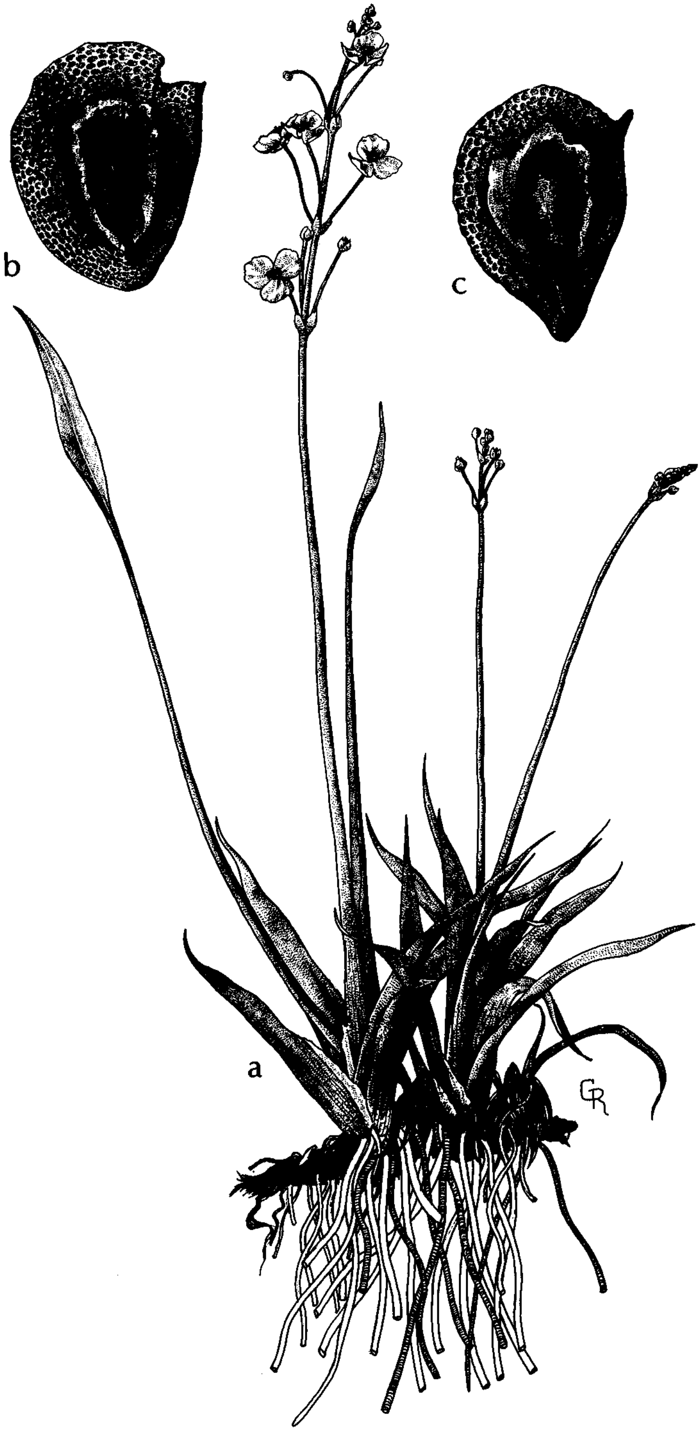

Fig. 30. **Sagittaria graminea:** a, habit of plant with basal portion submersed prior to and at time of flowering; b, c, achenes.

to 1 cm across. Achene obovate to oblong, winged, the dorsal wing twice as wide as the ventral, faces with 1–2 narrow ridges, beak subulate, to 0.4 mm long, borne just below the summit, or obsolete.

The elements of this "complex," as here conceived, have been variously treated as varieties or as species. For our range, we (attempt to) distinguish the following varieties:

11a. S. graminea var. **graminea.**

Phyllodes to 1 cm wide, acute apically, usually long-acute; blades of emersed leaves linear to elliptic, acute or long-acute apically; inflorescence unbranched, its bracts essentially free, triangular, acute. (*S. cycloptera* (J. G. Sm.) Mohr)

Usually in water but persisting if moisture does not become too limiting, cypress-gum depressions and ponds, wet prairies, swamps, small streams, drainage ditches and canals, borrow pits, *Hypericum* ponds, marshy shores. Nfld. and s. Labr. to Ont.; s. to Fla. and e. and s.cen. Tex.; Cuba.

11b. S. graminea var. **chapmanii** J. G. Sm.

Phyllodes as in var. graminea; blades of emersed leaves mostly linear or linear-lanceolate, long-acute apically; inflorescences branched from the first node, the axes slender throughout, the bracts essentially free, long-triangular, acute to subacuminate. (*S. chapmanii* (J. G. Sm.) Mohr)

In shallow water, usually not persisting if surface water recedes for a prolonged period, cypress-gum ponds, swamps and clearings of swamps, sloughs, drainage ditches and canals, marshy shores. Coastal plain, Ga., Fla., Ala.

11c. S. graminea var. **weatherbiana** (Fern.) Bogin.

Phyllodes membranous, 1–2.5 (–3) cm wide, not long-tapered distally or not tapered except at the acute to broadly obtuse tips; blades of emersed leaves elliptic and 2.5 dm long, 5 cm broad or a little more, short-tapered at both ends, varying to elongate linear-lanceolate and long-acute at both extremities; scape unbranched, flowers in 3–8 whorls, the bracts united to a little beyond the middle, the free tips short-triangular; stalks of the fruits 4–6.5 cm long (not exceeding 3 mm long in the preceding two vars.). (*S. weatherbiana* Fern.)

Shallow water of wooded swamps, flowing water of streams from swamps, spring runs in wooded areas. Coastal plain, Va. to n. Fla.

Sagittaria fasciculata E. O. Beal, a related species, is a very narrow and rare endemic in the highlands of n.w. North Carolina.

12. Sagittaria isoetiformis J. G. Sm. Fig. 31

Aquatic perennial with very slender rhizomes, forming corms at their tips. Leaves phyllodial, phyllodes occasionally somewhat dilated at the tips but not really bladed; on submersed plants phyllodes elongate-linear, flat and straplike, mostly gradually attenuate to the tips, to 4–5 dm long, very rarely dilated distally; on emersed plants (usually on shores after water level has receded) phyllodes much shorter, 0.5–1.0 dm long, flattened dorsally thus about hemispherical in cross-section, usually some with the tips slightly dilated. Scapes of submersed plants very slender, erect but weak, the inflorescence of 2–4 whorls of flowers (sometimes 1), the lower whorl pistillate, or if 4 whorls, the second sometimes pistillate as well; flowering portion of the scape erect and elevated just above the water surface; scapes of on-shore emersed plants a little stouter, usually not exceeding 1 dm tall. Stalks of the fruits spreading or ascending. Bracts of the inflorescence united to well above the middle, the lobes very broadly low-triangular. Fruiting heads to about 1 cm across, their sepals reflexed. Filaments dilated, pubescent. Achene obovate, about 1.5 mm long, with an irregularly crenate to entire wing, 2–3 low, smooth facial ridges, beak lateral near the summit, subulate, often hooked. (Misidentified by some workers (and authors) as *S. teres* S. Wats., a different plant occurring from e. Mass. to e. Md.)

Relatively shallow water, sinkhole ponds, cypress-gum ponds and lakes, marshy shores of impoundments. Coastal plain, s.e. N.C. to cen. pen. Fla. and s. Ala.

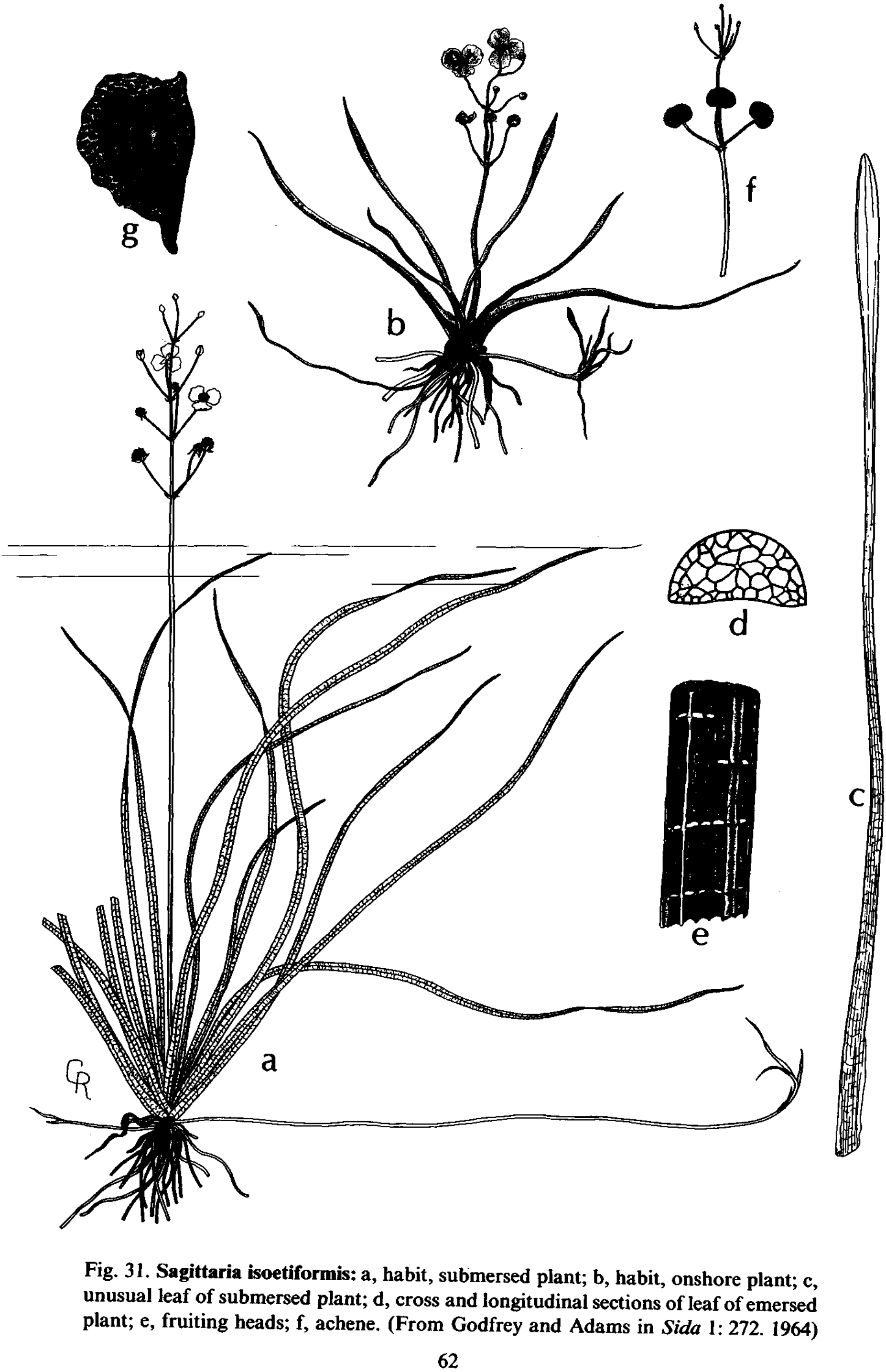

Fig. 31. **Sagittaria isoetiformis:** a, habit, submersed plant; b, habit, onshore plant; c, unusual leaf of submersed plant; d, cross and longitudinal sections of leaf of emersed plant; e, fruiting heads; f, achene. (From Godfrey and Adams in *Sida* 1: 272. 1964)

Butomaceae (FLOWERING-RUSH FAMILY)

• Flowers in umbels; carpels 15–20, fused at base.	1. *Limnocharis*
• Flowers solitary from the leaf axils; carpels 5–8, free.	2. *Hydrocleis*

1. Limnocharis

Limnocharis flava (L.) Buch.

Perennial rhizomatous aquatic herb with milky sap. Leaves emersed, alternate, lanceolate to broadly ovate; petioles angled. Flowers in umbellike clusters. Sepals 3. Petals 3, pale yellow or with white margins. Stamens numerous. Carpels 15–20 in whorls, forming follicles with numerous seeds. Fruiting scape recurved into water.

Reported to be present in s. Fla., probably introduced from W.I. or S.Am. Grown in aquaria and artificial ponds.

2. Hydrocleis

Hydrocleis nymphoides Buch. WATER-POPPY. Fig. 32

Perennial aquatic herb with rhizomes rooting at the nodes. Leaves alternate, long-stalked, the blades broadly ovate to suborbicular, often cordate basally, rounded apically, 5 cm long or more, margins entire, glossy above, somewhat spongy along the midrib, sparsely pubescent on the lower surface. Flowers axillary on long stalks, raised well above the water surface and lasting only a day. Sepals 3, leathery and persistent. Petals 3, thin, light yellow, obovate, 2–3 cm long. Stamens numerous, the outer ones sterile, the fertile ones purple or violet. Carpels 5–8, usually 6, free, forming follicles, each several-seeded.

Cultivated in aquaria, ponds, pools in s. U.S., somewhat naturalized locally in summer; native of Brazil.

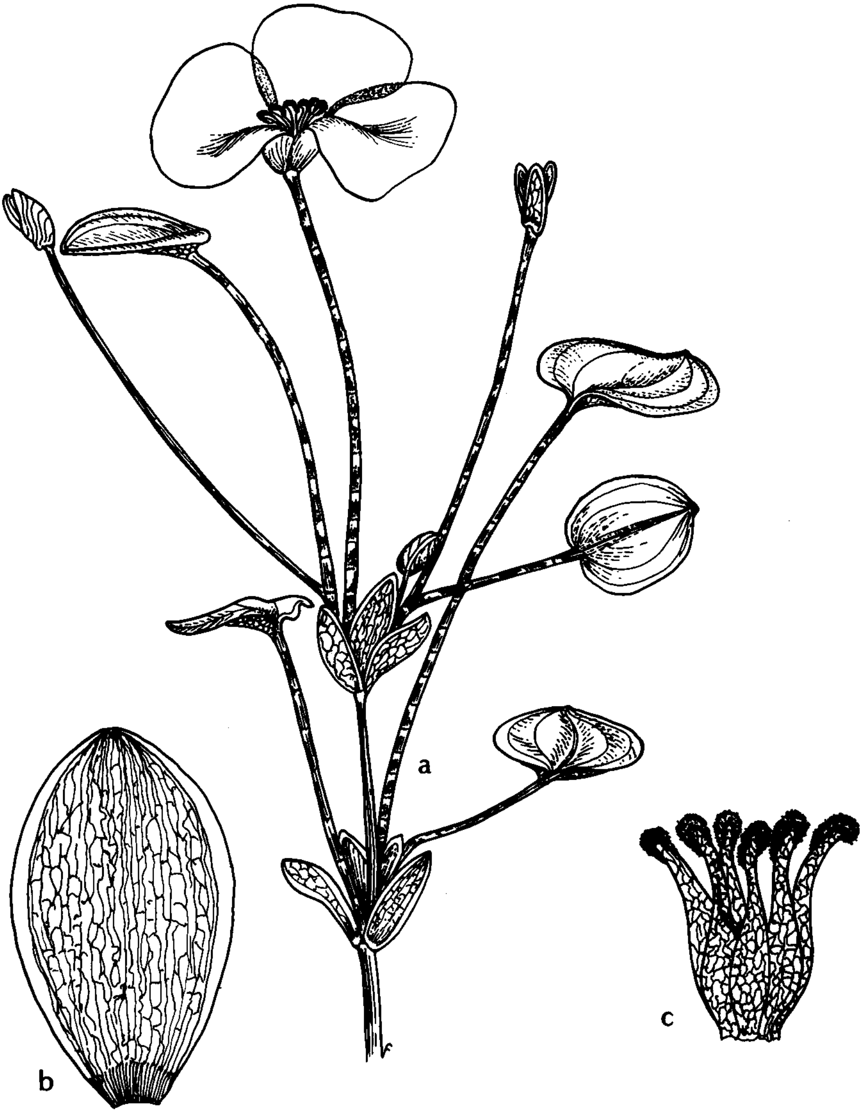

Fig. 32. **Hydrocleis nymphoides:** a, top of plant; b, sepal; c, carpels. (From Correll and Correll)

Hydrocharitaceae (FROG'S BIT FAMILY)

1. Aquatics of marine habitats.
  2. Leaves opposite or appearing verticillate on summits of short erect stems from horizontal rhizomes, the blades about 4 cm long. 1. *Halophila*
  2. Leaves alternate, closely set on very short, stoutish, erect stems from horizontal rhizomes, ribbon- or straplike, 1 dm long or more. 2. *Thalassia*
1. Aquatics of fresh, sometimes brackish, waters.
  3. Leaves long-petioled, the blades broadly ovate to broadly elliptical or reniform.
    4. The leaves mostly submersed and very thin-textured; flowers bisexual. 3. *Ottelia*
    4. The leaves mostly emersed or floating, firm textured; flowers unisexual. 4. *Limnobium*
  3. Leaves not petiolate, either very long and ribbon- or straplike, arising close together from a short vertical stem, or small and in many verticels on elongate stems.
    5. Leaves long and ribbonlike, arising close together from a short vertical stem.
      6. Annual; leaves 0.3–0.8 cm wide, with prominent midrib, their tips long-attenuate. 5. *Blyxa*
      6. Perennial; leaves 0.5–2.5 cm wide, usually more than 1 cm, with a scarcely perceptible midrib, their tips blunt. 6. *Vallisneria*
    5. Leaves short, in many verticels along the stem.
      7. The leaves 2–3 cm long or slightly longer. 7. *Egeria*
      7. The leaves not or mostly not exceeding 1.5 cm long, the longest sometimes to 2 cm.
        8. Margins of the leaves with teeth perceptible to the naked eye; midribs on lower leaf surface (when fresh) with a few conical protuberances tipped by sharp 1-celled teeth; fresh leaves notably rough to the touch. 8. *Hydrilla*
        8. Margins of the leaves not having teeth perceptible to the naked eye; midribs of lower leaf surface not pronounced, not bearing teeth; fresh leaves not rough to the touch. 9. *Elodea*

1. Halophila (SEA-GRASSES)

Submersed marine aquatics. Plants with horizontal scaly rhizomes and with short erect leafy branches bearing a pair of opposite scales near the middle and opposite leaves near the apex. Flowers unisexual, borne in a sheath, the male stalked, the female sessile, sometimes both in the same sheath. Sepals small, petals none. Stamens 3. Fruit an ovoid capsule containing many seeds.

- Leaves one pair at the apex of the short erect branches 2–4 cm long. 1. *H. baillonis*
- Leaves in 2–3 pairs, closely set and appearing verticillate at the ends of erect branches to 10 cm long. 2. *H. engelmannii*

1. Halophila baillonis Asch.

Plant delicate, the erect branches 2 (–4) cm long. Leaf blades oblong, linear-oblong or spatulate, minutely serrulate, only the midvein prominent.

Sandy or marly reefs and lagoons. Fla. Keys; Bermuda, W.I.

2. Halophila engelmannii Asch. Fig. 33

Plant delicate, the erect branches to 10 cm long and with 2–3 closely set pairs of leaves at their summits. Leaf blades elliptic, oblong, or oblanceolate, their margins irregularly wavy.

Bays and reefs. Fla. Keys, Gulf coast, Fla. to Tex.; Bah. Is., W.I.

2. Thalassia

Thalassia testudinum Koenig. TURTLE-GRASS. Figs. 34 and 35

Marine perennial with stout, branched, horizontal rhizomes bearing at intervals short vertical shoots, each with several closely set leaves. Usually the short stems covered with

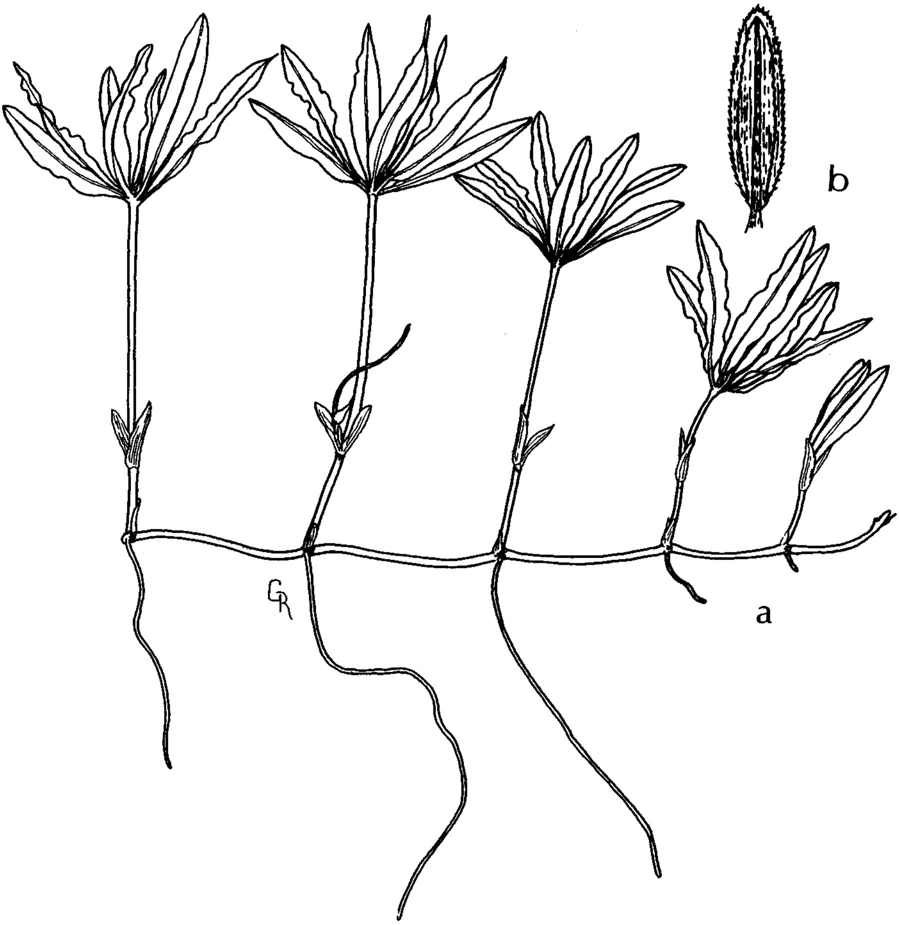

Fig. 33. **Halophila engelmannii:** a, habit; b, young leaf.

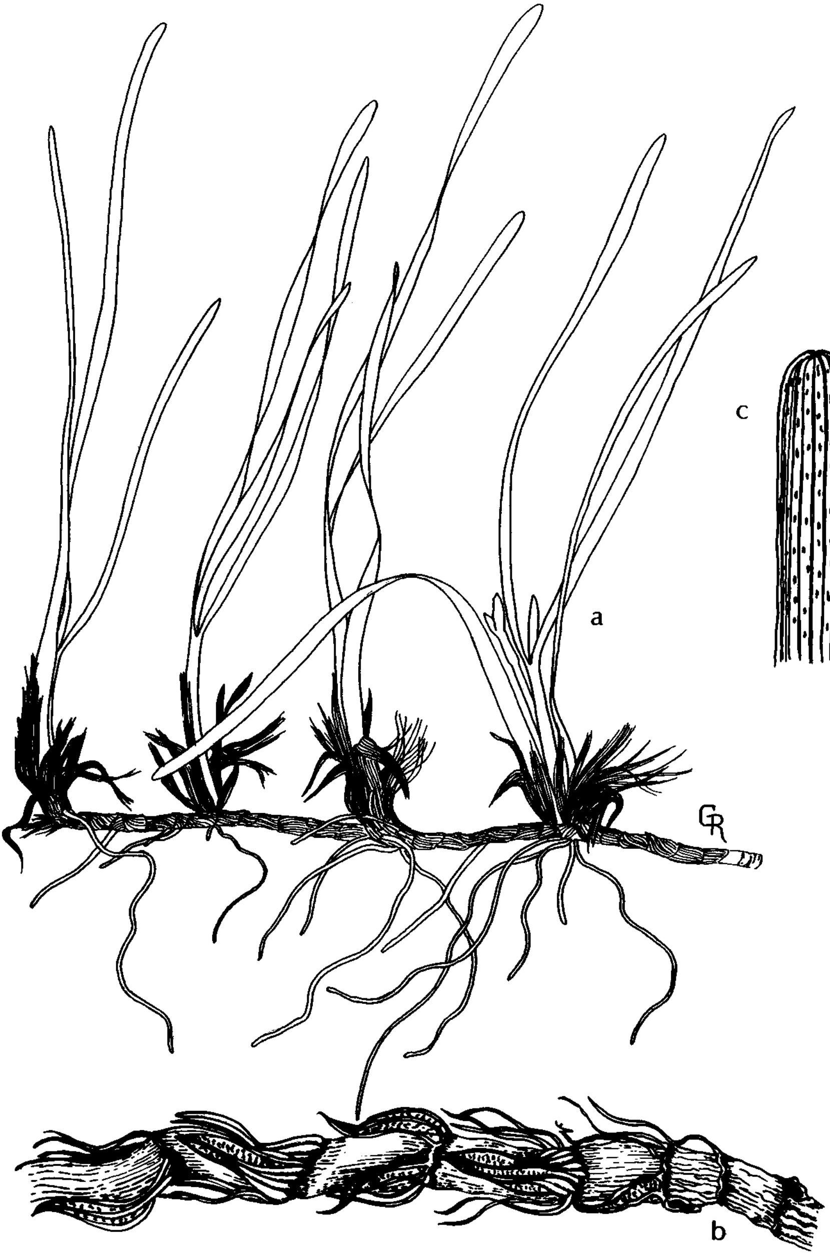

Fig. 34. **Thalassia testudinum:** a, habit; b, rhizome; c, leaf tip.

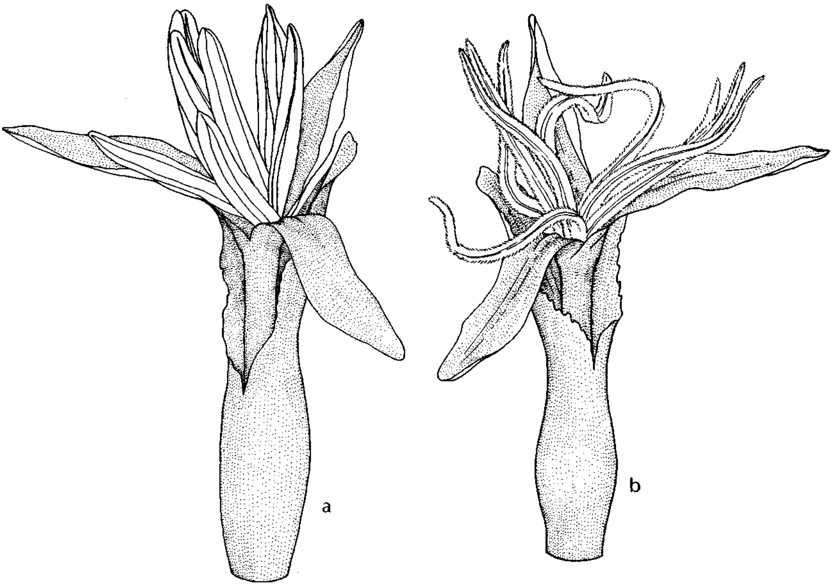

Fig. 35. **Thalassia testudinum:** a, staminate flower; b, pistillate flower.

fibrous remains of old leaves. Leaves 2-ranked, sheathing at base, broadly linear, ribbon- or straplike, about 1 cm wide, to 35 cm long, flat, the tips rounded, upper margins denticulate. Flowers unisexual, usually solitary, arising from the leaf axils, plants dioecious; flower arising from a spathe tubular at the base, split and flaring above and then 2-cleft; perianth segments 3, straplike; staminate flower with stamens 9 (–6), the anthers linear, about 8 mm long; pistillate flower with several very short styles each bearing 2 elongate linear stigmas. Fruit nearly globose, about 2 cm across, rough-warty, opening by 5–8 valves and when open appearing much like an earth-star.

Forms extensive marine meadows in water to a depth of just over 4 m, the only marine seed plant in our area with ribbon- or straplike leaves. Coastal waters, Fla. to Tex., s. to n. S.Am.; Berm., W.I.

3. Ottelia

Ottelia alismoides (L.) Pers. Fig. 36

Submersed or partly emersed aquatic with long-petioled thin leaves (especially the submersed ones) which are broadly ovate, elliptic to reniform, sometimes cordate, with parallel curving veins and suggesting those of plantain or water plantain. Flowers bisexual, fragrant, borne singly on a several-angled stalk; sessile from an elliptic to ovate spathe having a 2-segmented tip. Perianth with linear to oblong, obtuse, 1-nerved sepals about 16 mm long and 4 mm wide, the petals white to pale pink, yellow at base, obovate, 2–3 cm long. Anthers bright yellow. Fruit more or less oblong, beaked, to about 4 cm long, its surface very irregularly winged.

An Afro-Asian plant abundantly though locally naturalized in s.w. La.

4. Limnobium

Limnobium spongia (Bosc.) Steud. FROG'S BIT. Figs. 37 and 38

Perennial herb, commonly in dense floating mats or rooted in mud in wet marshy areas. Plantlets developing at the ends of runners and also developing from seeds, forming floating rosette leaves which are nearly reniform and have a very distinctive central disk of purplish spongy tissue below. From these rosettes eventually develop dissimilar much more robust plants comprised of clusters of ascending and erect long-petioled leaves from a short axis; it is on these that flowering and fruiting takes place. Leaves of mature clusters with petioles up to 1.5 dm long; blades ovate to suborbicular, to about 7 cm long and wide, the bases truncate, cordate, or broadly tapered, the apices obtuse or rounded. Flowers unisexual, the plants monoecious; solitary from the leaf axils, their stalks much shorter than the petioles, several on each plant but developing one at a time over a considerable period. Sepals 3 and petals 3 surmounting a floral tube. In the staminate flower the filaments are fused forming a thickish column, 6–12 anthers diverging from the column at different levels. Pistillate flower with an inferior ovary, 6 (–9) deeply divided stigmas. Fruit a fleshy, many-seeded berry, its thickish stalk strongly recurved. Seed covered with spikelike trichomes.

In shallow quiet waters or marshy borders, ponds, lakes, lagoons, ditches and drainage canals, and in swamps. Lake Ontario; N.J. s. to n. Fla. and e. Tex., in the interior to Mo. and s. Ill.

5. Blyxa

Blyxa aubertii Rich. Fig. 39

Annual aquatic. Leaves in a rosette on a very short stem, ribbonlike, thin and flaccid, 0.3–0.8 cm wide, from about 1–4.5 dm long, their tips long-attenuate, margins finely saw-toothed, midrib prominent. Flowers borne terminally on a slender stalk up to 4.5 dm long, the stalk frequently somewhat bent distally, sessile, surrounded by a slightly

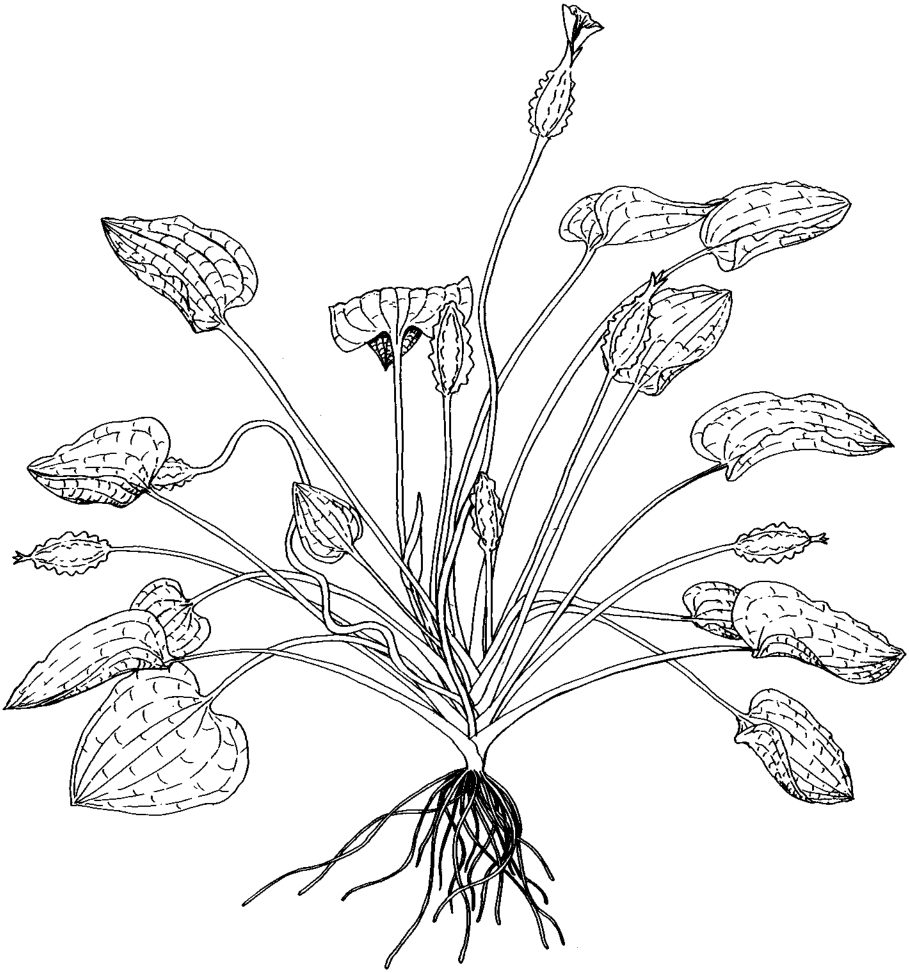

Fig. 36. **Ottelia alismoides.** (Redrawn with permission of John W. Thieret from cover illustration, *Aquatic and Marsh Plants of Louisiana.* 1972)

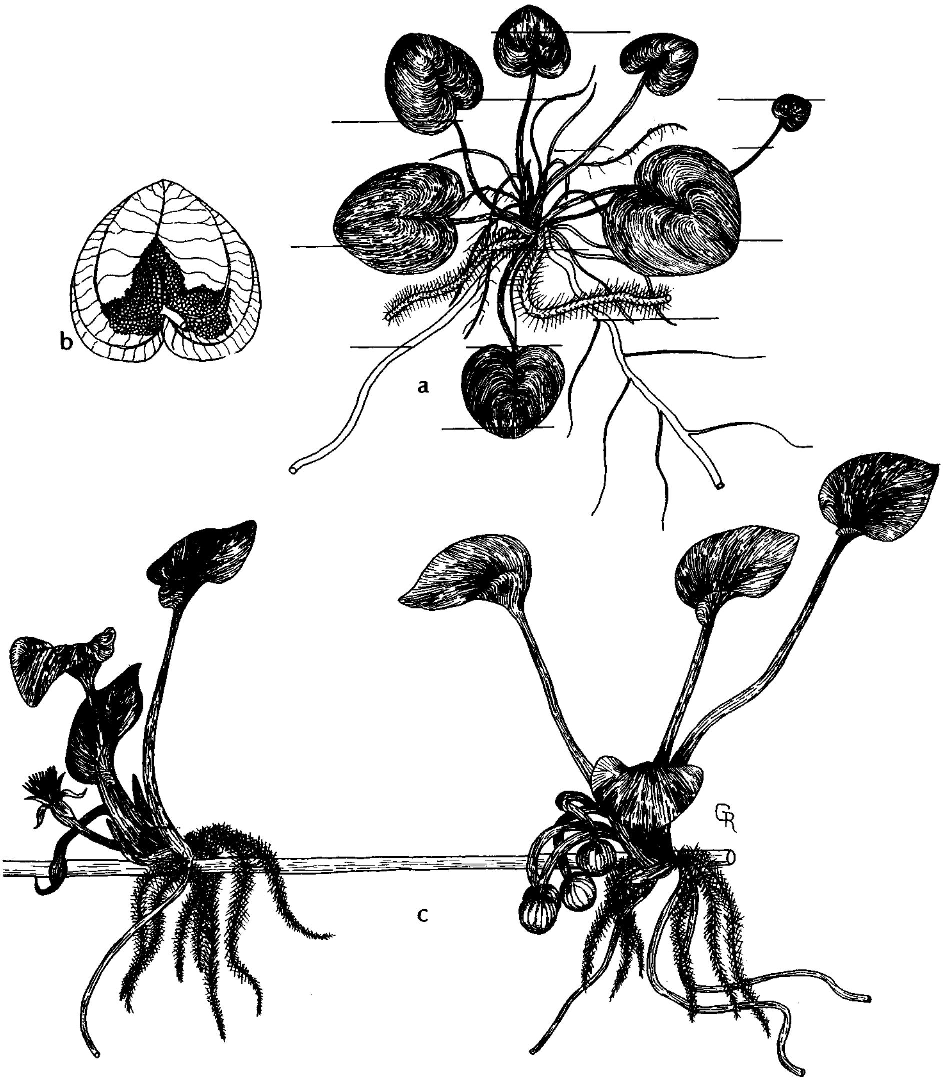

Fig. 37. **Limnobium spongia:** a, rosette of floating stage of plant; b, lower surface of rosette leaf; c, portion of plant at flowering and fruiting stage.

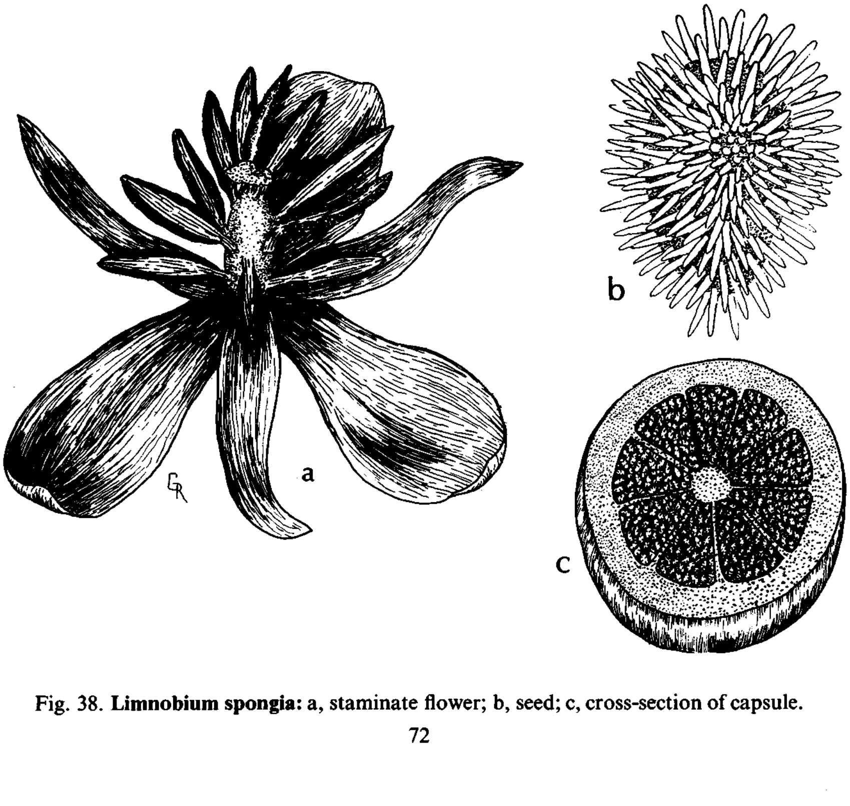

Fig. 38. **Limnobium spongia:** a, staminate flower; b, seed; c, cross-section of capsule.

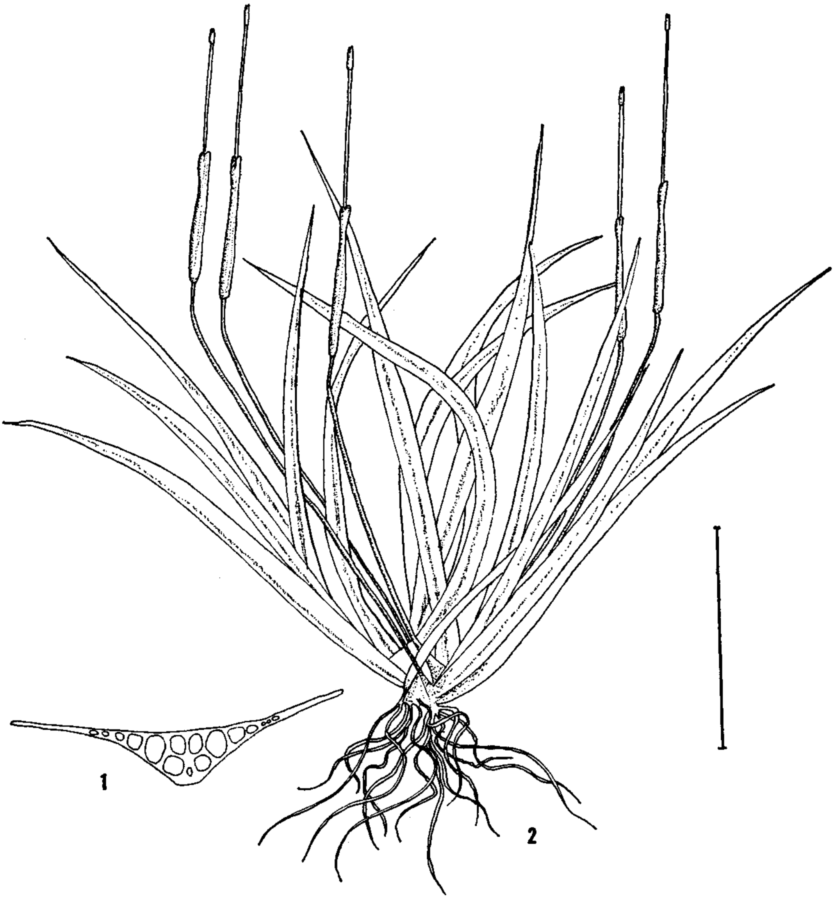

Fig. 39. **Blyxa aubertii:** 1, cross-section of leaf; 2, habit. (From Thieret in *Sida* 3: 343–344. 1969)

compressed, narrow, elongate 6-ribbed spathe 3.5–4.6 cm long, 2 mm wide. Perianth segments surmounting the floral tube 6, 3 each in 2 series, the outer 6.5–7.0 mm long, lanceolate, obtuse apically, the inner 10 mm long. Stamens 3. Fruit linear, 3.5–4.6 cm long, 0.2 cm wide, included within the spathe except for the extruded beak about 8 cm long. Seeds ellipsoidal, 1.6–1.8 mm long, about 1 mm wide, with 8–11 irregular, tuberculate ridges.

Adventive in lakes and rice fields, La. Native from Madagascar to India, n. to Kor., Jap., eastward to New Guinea and n. Austl.

6. Vallisneria

Vallisneria americana Michx. WATER-CELERY, TAPE-GRASS, EEL-GRASS. Fig. 40

Submerged aquatic perennial. Several ribbonlike leaves of varying lengths borne on short vertical stems, the latter arising as short-stemmed clusters from nodes of horizontal rhizomes. Numerous, fibrous, unbranched roots borne about the bases of the vertical shoots. Longer leaves commonly with their tips more or less floating on the water surface. Leaves with a scarcely perceptible midrib, to transmitted light appearing very fine lined and with irregular darker green partial cross lines. Leaf margins bearing minute staggered teeth. Plants dioecious. Male inflorescence short stalked in a closed spathe within which some 200 tightly packed slender-pedicillate staminate flowers are borne. Staminate flowers tiny, with 3 very thin, completely transparent, spoonlike sepals, 2 of equal size, the third, somewhat smaller. Above and opposite the smaller sepal is the smaller, tongue-like, completely transparent petal. Above and between the 2 larger sepals is a single, transparent, much reduced sterile stamen. Fertile stamens 2, filaments fused at the base. Pistillate flowers borne singly from the leaf axils, each at the end of a peduncle as long as or longer than the longest leaves. Bud enclosed in a transparent spathaceous envelope which tightly invests it. As the flower becomes fully developed the spathe splits at the summit and by elongation of the floral tube the flower extends beyond the spathe, the latter ultimately appearing like a bract at the base of the very much elongated fruit. At anthesis, the open summit of the female flower is at the water surface. Subsequent to pollination (and presumably fertilization), the flower stalk coils markedly thus pulling the developing fruit well beneath the surface of the water where it matures. Floral tube long-cylindrical, surmounted by three spreading, ovate-oblong, thickish persistent sepals about 3–4 mm long. Alternate with each sepal, just above the sinus between two sepals, is a tiny rudimentary petal which soon disintegrates. Style short, stigmas 3, each cleft to the base. Fruit 1-locular, bearing 250–500 seeds, or thereabouts, throughout its length. Mature capsule dehisces longitudinally by one valve and the seeds are shed in a copious mass of gelatinous material.

In both quiet and swiftly flowing waters. N.S. and Que., w. to N.Dak. and S.Dak., generally in the eastern and southern states to s. Fla., e. Tex., N.Mex., Ariz.

Two species, *Vallisneria americana* and *V. neotropicalis* Marie-Victorin have been distinguished in our area, the latter from Florida (and possibly other Gulf States) and Cuba. In many of the large springs and spring-fed, clear-water streams of Florida, in which the water is cool and remains at very nearly a constant temperature (approximately 70 degrees F.) throughout the year, *Vallisneria* may become a relatively very large plant. This apparently is identifiable as *V. neotropicalis.* The differences between this and *V. americana,* as usually described, appear to be quantitative. In any one spring or stream a range of size variation exists, even in flowering and fruiting specimens. It is suggested that in the southern latitudes, particularly in waters with nearly constant temperatures year on end, the large size of plants is a consequence of the factors favoring continuous growth and that size differences of the plants in these places is correlated with the age of individual plants or clones.

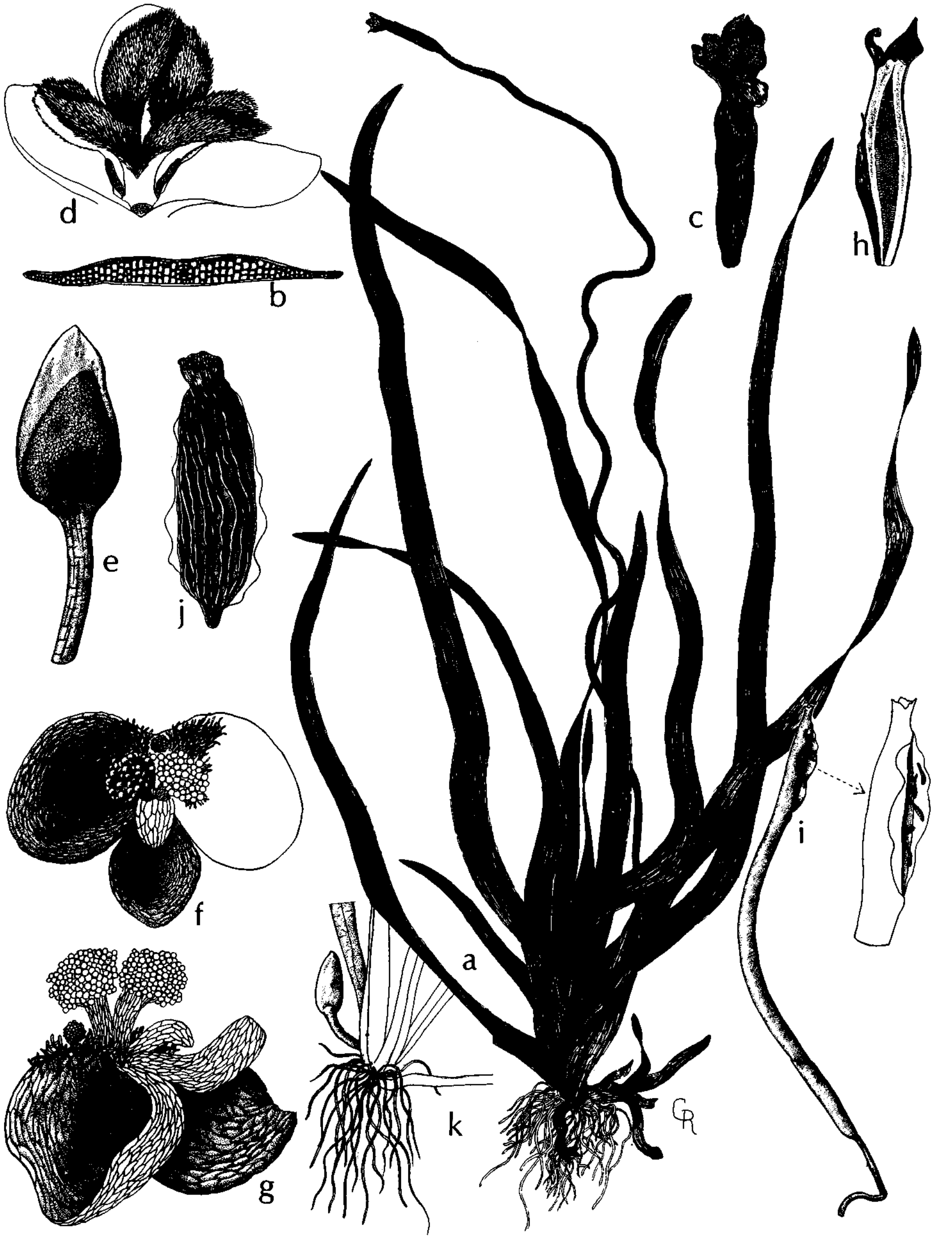

Fig. 40. **Vallisneria americana:** a, pistillate plant; b, cross-section of leaf; c, pistillate flower; d, top view of flower showing stigmas; e, spathe containing staminate flowers; f–g, staminate flower (two views); h, longitudinal section of capsule; i, fruit; j, seed; k, base of staminate plant with spathe.

7. Egeria

Egeria densa Planch. WATERWEED. Figs. 41 and 42

Submersed perennial herb of fresh waters, rooted in the substrate or, commonly, pieces free in the water. Stems elongate, slender, 2–3 mm thick, single or sparingly branched. Lowermost leaves opposite, otherwise in whorls, the number per whorl variable, usually 3–6, the whorls close together; sessile, bright green and flaccid, nearly linear, their apices subobtuse, or abruptly very short acuminate, very finely toothed on the margins and sometimes on the midrib below, 2–3 cm long or slightly longer. Flowers unisexual (only male plants known to us in our area); staminate spathe in the axil of an upper whorl, 2 (–4) flowers from a given spathe, developing one at a time, their stalks bringing them to or raising them just above the water surface. Sepals 3, green, 3–4 mm long. Petals 3, white, suborbicular, 8–10 mm long. Stamens 9. (*Elodea densa* (Planch.) Casp.; *Anacharis densa* (Planch.) Vict.)

A South American plant abundantly and widely naturalized in streams, ponds, lakes, often a pest and a menace to boats in impoundments, constructed lagoons, and channelized streams. Naturalized in the eastern and Gulf states, sporadic in some other states.

8. Hydrilla

Hydrilla verticillata (L. f.) Royle. Fig. 42

Plant with horizontal stems in the substrate forming tubers under certain conditions, ascending stems, in deeper water at least, elongate, widely branching, the ultimate branchlets numerous (forming turions under certain conditions). Known to us in as much as 8.5 m of quiet water, rooted in the substrate there and growing to the surface where the branchlets extend horizontally. Leaves sessile, verticillate, mostly 4–8 in a verticel, sometimes 3, rarely 2, the number in a verticel variable on a given stem, even in adjacent verticels; verticels on elongate main stems usually relatively distant, to at least 8 cm apart, usually very close together on the ultimate branchlets; leaves mostly 1.5 cm long (smaller on the flowering branchlets), nearly oblong, broadest at the base, the sides nearly parallelling to near the acute tip; serrate marginally (evident to the naked eye), the serrations tipped by sharp 1-celled teeth; 1-nerved, the nerve low-keeled below, the keel bearing conical protrusions, these tipped by 1-celled sharp teeth, the teeth soon deciduous or disintegrating leaving the conical protrusions. (Conical protrusions scarcely if at all evident on pressed-dried specimens.) Fresh leaves very noticeably rough to the touch. Flowers unisexual, the plants dioecious. Flowers arise singly from a spathaceous envelope in the leaf axil. Staminate flowers (not seen by us) said to be short-stalked, detaching and floating free at anthesis. Pistillate flowers from few to several, commonly 8–12, from leaf axils near tips of submersed branchlets (apparently mostly on branch tips whose proximal portions are in a stage of disintegration); spathe about as long as the subtending leaf; floral tube translucent, sometimes suffused with purplish pigment, slender and threadlike, 4–5 cm long, surmounted by 6 perianth segments, 3 each in 2 series; segments translucent, without color, very inconspicuous, spatulate, the outer broader than the inner, about 4 mm long; stigmas 3, sessile, linear, pubescent.

Introduced from the Old World, now abundantly naturalized in peninsular Florida and rapidly becoming so in northern Florida. A pest and a menace in canals, constructed lagoons, channellized streams, ponds, lakes, impoundments; also in clear waters of spring-fed streams. Ga., Fla., La., Tex.; Pan., perhaps elsewhere.

9. Elodea (WATERWEED, DITCHMOSS)

Perennial submersed aquatics, rooted or drifting free when broken loose; stems sparsely dichotomously branched. Lowest leaves alternate, opposite, or in whorls of 3 and reduced; middle and upper leaves opposite or in whorls of 3–7, linear to oblong,

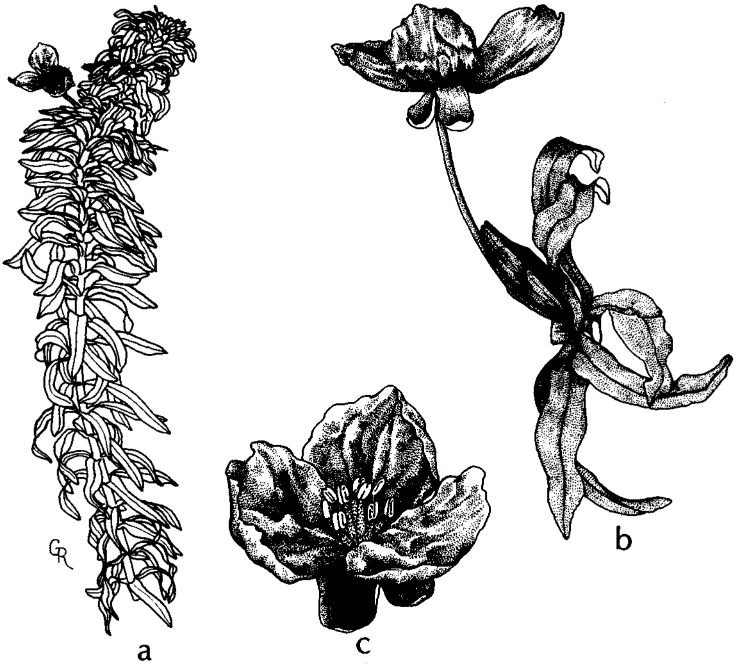

Fig. 41. **Egeria densa:** a, tip of plant; b, spathe and flower; c, staminate flower.

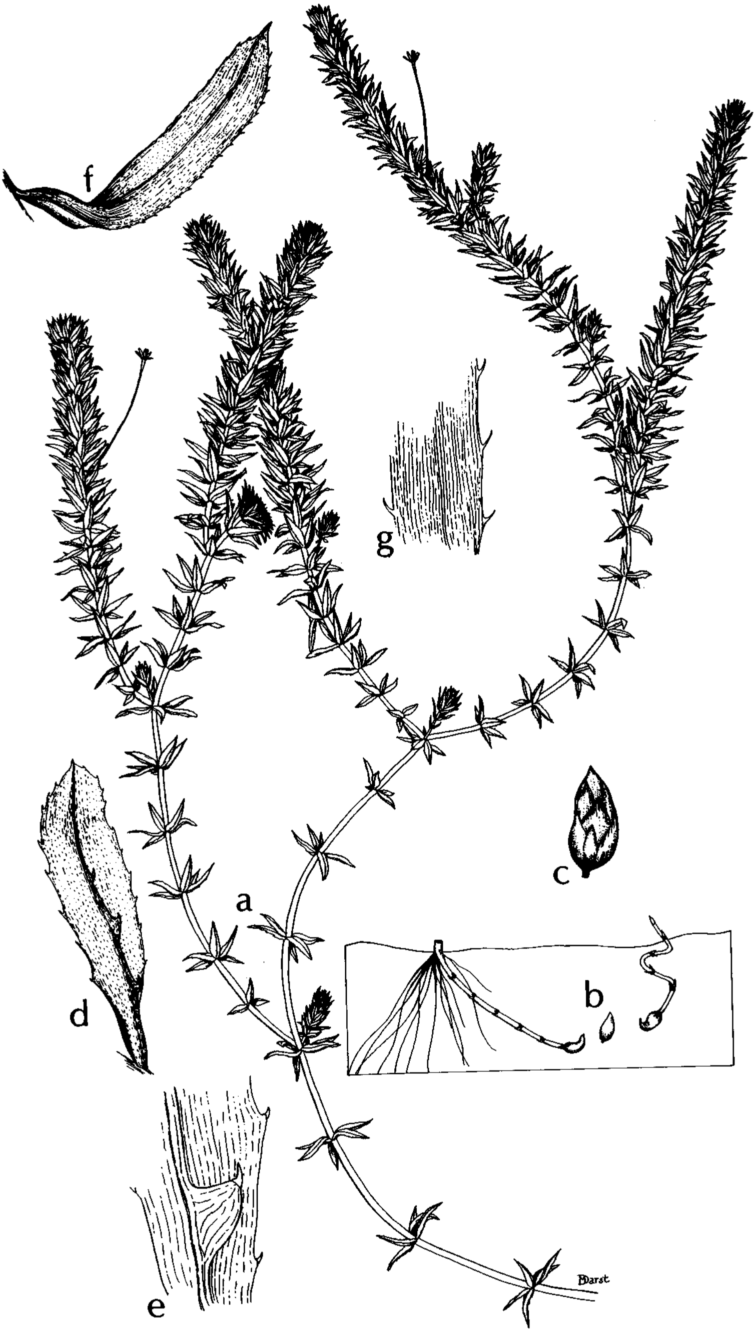

Fig. 42. a–e, **Hydrilla verticillata:** a, habit; b, tuber (center), germinating tuber (right), base of plant from tuber after root formation; c, enlargement of tuber; d, lower surface of leaf; e, enlargement of portion of lower leaf surface; f–g, **Egeria densa** (for contrast): f, lower leaf surface; g, enlargement of portion of lower leaf surface.

denticulate, 1-nerved. Flowers borne from spathes, mostly unisexual. Stamens 3–9, stigmas 3. Staminate flowers single in a globose spathe, usually sessile, occasionally with a short floral tube; pistillate flowers solitary in a tubular spathe, raised to the water surface by a slender floral tube enclosing the style; sepals 3, petals 3, white. Fruit a several seeded capsule.

- **Staminate flowers sessile, at anthesis deciduous from plant, floating to water surface; leaves less than 1.5 mm wide, acute at apex. 1. *E. nuttallii***
- **Staminate flowers with a pedicellate floral tube, not deciduous from plant; leaves about 1.5 mm wide, obtuse-apiculate at apex. 2. *E. canadensis***

1. **Elodea nuttallii** (Planch.) St. John.

Staminate spathe sessile. Staminate flowers single in each spathe, sessile, at anthesis released, floating to and opening at the water surface; sepals about 2 mm long, 1.6 mm wide; petals absent. Pistillate spathe narrowly cylindric, usually 1–1.5 cm long; flowers stalked by an elongate floral tube up to 9 cm long; sepals about 1.1 mm long, petals 1.3 mm long. Seeds pilose. (*Anacharis nuttallii* Planch.)

Fresh or brackish waters. Que., Maine, to N.C., w. to Minn., Okla., N.Mex., Idaho.

2. **Elodea canadensis** Rich. in Michx. Fig. 43

Staminate spathe with a pedunculate base, inflated, 7 mm long, 4 mm wide. Staminate flowers pedunculate by the elongate, filiform base of the floral tube, not released from the plant at anthesis; sepals 3.5–5.0 mm long; petals 5 mm long. Pistillate spathe cylindric, flowers stalks to 15 cm long; sepals and petals about 2–3 mm long. Seeds glabrous. (*Anacharis canadensis* (Rich. in Michx.) Rich.)

Lakes, ponds, streams. Que. to Sask., s. to Va., (Ala. ?), Okla., N.Mex. to Calif.; introd. in various places in Old World.

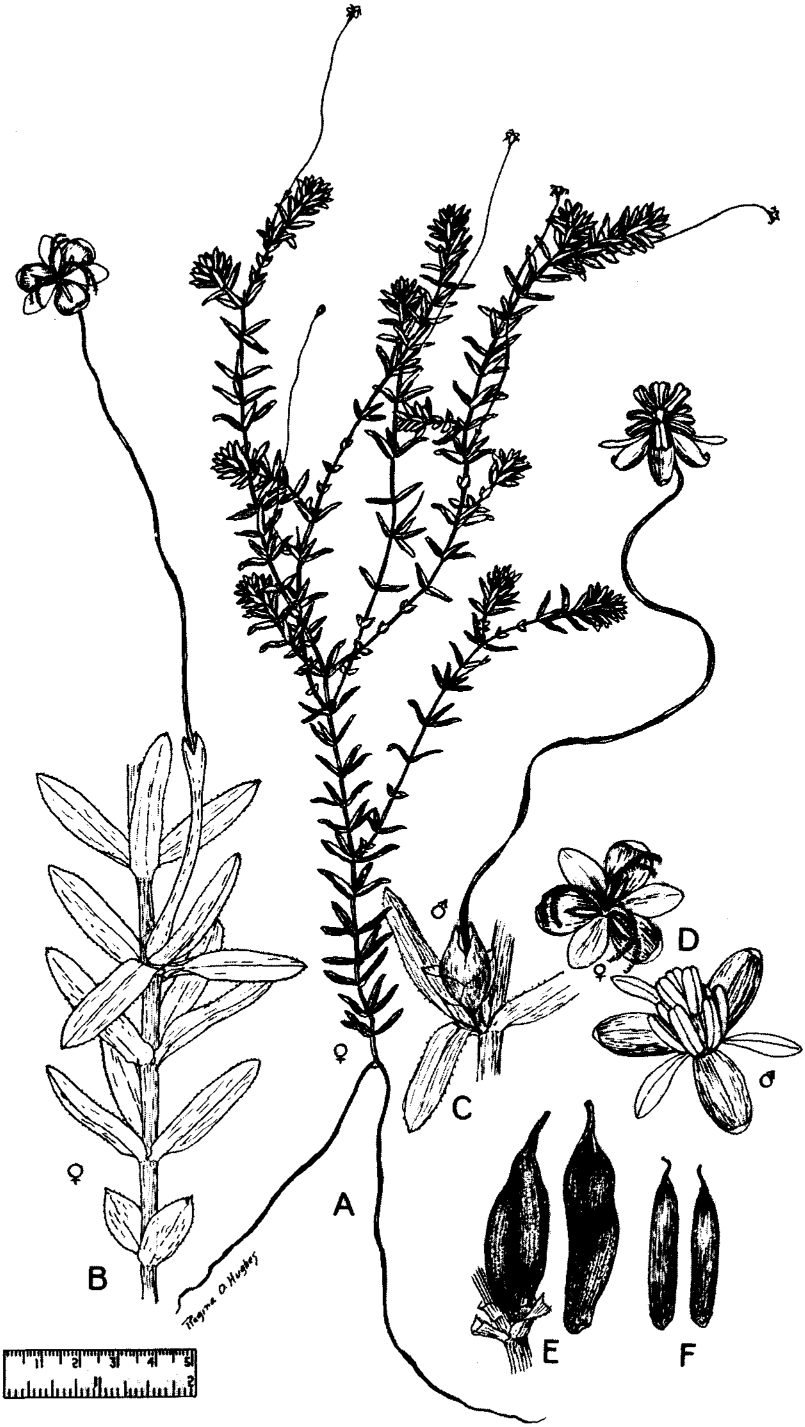
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Fig. 43. **Elodea canadensis:** A, habit, pistillate plant; B, flower and leaf detail, pistillate plant; C, flower and leaf detail, staminate plant; D, pistillate flower (above), staminate flower (below); E, capsules; F, seeds. (From Reed, *Selected Weeds of the United States* (1970) Fig. 13)

Gramineae (GRASS FAMILY)

Grass leaves are arranged alternately on opposite sides of the stem and are thereby 2–ranked, a condition which is strikingly evident in some grasses, less so in others. The lower portion of the leaf usually closely envelops the stem and is referred to as the sheath. Sheaths of grasses usually have free margins and hence are said to be open or split; in a few genera the sheaths are closed thus forming a tube about the stem. The upper portion of the leaf, which diverges from the stem, is called the blade. Externally, at the junction of the sheath and blade there is usually a differently colored area, the collar, the margins of which may be laterally extended as small lobes or auricles. Inside, at the juncture of the sheath and blade, there is, in most grasses, an extension of the inner lining of the sheath, the ligule. It may be membranous, variously textured, or a fringe of hairs or bristles of assorted character.

The basic unit of the grass inflorescence is the *spikelet* and the spikelets are disposed in various ways, commonly in panicles. Identification of grass species requires careful examination of the spikelet characteristics and for the beginner, especially, it is essential to conceptualize a model spikelet so that various descriptive attributes of the parts, including sometimes presence or absence of parts in the model, can be understood. As a model one may arbitrarily choose a 5–flowered spikelet. At the base of the spikelet are two empty bracts or scales called *glumes.* Above the glumes in alternate succession are the florets each consisting of two opposite bracts enclosing the flower. The outer, larger bract is known as the *lemma,* the inner, usually shorter and thinner, bract is the *palea.* The flower usually has three stamens and a single central pistil tipped by feathery stigmas. At the base of the flower are two small, thin or fleshy scales, the *lodicules.*

The arrangement of spikelets and the type of inflorescence formed, the number of florets the spikelet contains, the presence of one part and the absence of another, are among the kinds of things it is necessary to discern and perceive in order to achieve some facility in identification of grasses.

1. Plants rarely observed in flower.
2. Stems hard and "woody." 48. *Arundinaria*
2. Stems herbaceous.
3. Leaf blades 5–10 mm long, hard, rigid, subulate. 45. *Monanthochloe*
3. Leaf blades 2–3 cm long, flat, soft. 53. *Hydrochloa*
1. Plants flowering regularly.
4. Soft or silky hairs present throughout the spikelet-bearing portion of the inflorescence, producing a plumelike, feather-duster, or feathery effect.
5. Spikelets in pairs, one sessile, the other stalked (in some the stalked one rudimentary or even reduced to the hairy stalk).
6. Spikelets of the pair alike and bisexual. 27. *Erianthus*
6. Spikelets of a pair unlike, the sessile bisexual, the stalked one staminate or vestigial, the latter even reduced to a hairy stalk.
7. Inflorescence solitary and terminal, elongate and spikelike. 33. *Elyonurus*
7. Inflorescence (overall) branched, the ultimate divisions bearing 1 or 2–several racemes.
8. Ultimate divisions of the inflorescence bearing solitary racemes. 32. *Schizachrium*
8. Ultimate divisions of the inflorescence bearing 2–several racemes. 29. *Andropogon*
5. Spikelets not in pairs with one stalked, the other sessile; inflorescence large and plumelike.
9. Silky hairs borne over the surface of the lemma; axis of the spikelet glabrous. 54. *Arundo*
9. Silky hairs borne on the axis of the spikelet below the floret, or on the margins of the lemma.
10. Leaf sheaths woolly at the summit. 56. *Neyraudia*
10. Leaf sheaths not woolly at the summit. 55. *Phragmites*
4. Soft or silky hairs not present throughout the spikelet-bearing portion of the inflorescence, or if present then not conspicuous and not producing a plumelike effect.

11. Spikelets in two or more rows on one side of the axis bearing them, or in one or more rows on either side of one of the angles of a 3-angled axis.

12. Spikelets sessile, all on one side of a usually curvate axis 6–15 cm long, closely set in 2 rows and strictly at right angles to the axis thus giving a pectinate appearance. 43. *Ctenium*

12. Spikelets and inflorescence not with the above combination of characters.

13. The spikelets very strongly flattened, sessile and closely overlapping. 42. *Spartina*

13. The spikelets not very strongly flattened, mostly plano-convex.

14. Glumes both absent, or sometimes one glume present on the terminal spikelet of the raceme. 17. *Reimarochloa*

14. Glumes, one or both, present on all spikelets.

15. Second glume with a short upwardly barbed awn. 41. *Chloris*

15. Second glume not at all awned.

16. Fertile lemma transversely rugose. 20. *Paspalidium*

16. Fertile lemma smooth.

17. Stalk of the spikelet terminated by a narrow ringlike callus adnate to which or immediately above which is a small cuplike first glume, this seemingly below the spikelet proper. 18. *Eriochloa*

17. Stalk of the spikelet not as above.

18. Spikelets in 4 rows, 2 on either side of one of the angles of the axis. 22. *Echinochloa*

18. Spikelets not in 4 rows.

19. The spikelet with the convex side turned away from the axis bearing it and the flat side toward the axis.

20. Glumes both present, the first toward the axis. 15. *Brachiaria*

20. Glumes not both present, the first absent. 16. *Axonopus*

19. The spikelet with the convex side turned toward the axis, the flat side turned away from the axis.

21. Fertile lemma with hyaline or scarious margins that are not inrolled. 13. *Digitaria*

21. Fertile lemma hard or indurate, the margins inrolled, not hyaline or scarious. 19. *Paspalum*

11. Spikelets not borne in rows on one side of the axis.

22. Glumes absent or scalelike and inserted below the knoblike base of the spikelet.

23. Spikelets flat; florets bisexual.

24. The spikelets not exceeding 5 mm long; both glumes absent. 50. *Leersia*

24. The spikelets 7–10 mm long; glumes tiny, scalelike, inserted just above cuplike summit of spikelet stalk and below knoblike base of floret. 49. *Oryza*

23. Spikelets not flat; florets unisexual.

25. Staminate and pistillate spikelets on the same branches, the pistillate terminal, the staminate basal. 52. *Zizaniopsis*

25. Staminate spikelets on flexuous or pendulous lower branches of the inflorescence, the pistillate on stiffly ascending upper branches. 51. *Zizania*

22. Glumes, or at least one glume, present.

26. Spikelets subtended by 1–numerous barbed or feathery bristles.

27. Bristles falling with the spikelets at maturity; robust perennial forming very large dense clumps or clones; stems 2–4 m tall. 25. *Pennisetum*

27. Bristles persisting on the axes after the spikelets fall; annual or perennial but not forming very large dense clumps or clones (if as tall as 2–4 m, then a robust annual). 24. *Setaria*

26. Spikelets not subtended by barbed or plumose bristles.

28. The spikelet with a distended round swelling on one side near the base (actually the base of the second glume), i.e., gibbous. 23. *Sacciolepis*

28. The spikelet not gibbous.

29. Inflorescence cylindrical, the axis with very thick joints, the base of each joint on one side with a concavity into which the spikelet fits closely, appearing as though the spikelets are a part of the main diameter of the axis. 34. *Manisuris*

29. Inflorescence not as described above.

30. Spikelets in pairs, one sessile, the other stalked.

31. Plant with weak, usually decumbent spreading stems; inflorescence a single, very narrow spikelike raceme, or 2–3 subdigitate spikelike racemes. 31. *Microstegium*

31. Plant with tall, coarse, erect stem; inflorescence a diffuse panicle. 28. *Sorghum*

30. Spikelets not in pairs with one sessile, the other stalked.

32. The spikelets all sessile.

33. Leaf blades cordate clasping at the base. 30. *Arthraxon*

33. Leaf blades not cordate clasping at the base.

34. Inflorescence axis conspicuously jointed, bearing pairs of spikelets (rarely 1 or 3) at the nodes, the axes of the spikelets somehow distorted so that the glumes of each of the pair are on one side of the spikelet, the side away from the axis of the spike. 11. *Elymus*

34. Inflorescence axis not conspicuously jointed, not bearing spikelets in pairs, glumes not as above.

35. Spikelets 3–12-flowered, alternately disposed in 2 rows on the axis; first glume 1-nerved. 40. *Leptochloa*

35. Spikelets with 1 bisexual floret, not alternately disposed in 2 rows on the axis; first glume 3-nerved. (Spikelets are actually subsessile rather than strictly sessile but genus is keyed here in case one were to take spikelets as sessile). 22. *Echinochloa*

32. The spikelets stalked.

36. Spikelets 2–several-flowered.

37. Florets unisexual, the staminate and pistillate on different plants.

38. Plant with subterranean rhizomes, the flowering stems erect. 44. *Distichlis*

38. Plant without subterranean rhizomes, but stems decumbent below and rooting at the nodes. 35. *Eragrostis*

37. Florets all bisexual or if some unisexual both kinds in the same spikelet.

39. Lemmas pubescent at the base and on the nerves, at least on the lower half of the nerves.

40. Central nerve, or all 3 nerves of the lemma excurrent as a mucro apically. 36. *Tridens*

40. Central nerve, nor any of the nerves of the lemma excurrent. 2. *Poa*

39. Lemmas glabrous or at most scabrid on the nerves.

41. Spiketets truncate both basally and apically. 3. *Briza*

41. Spikelets not truncate both basally and apically.

42. Lemmas awned.

43. Spikelets mostly 6–8-flowered. 1. *Festuca*

43. Spikelets 2–3-flowered.

44. Spikelets 2-flowered, the lower floret staminate, the upper bisexual; lemma of the staminate floret bearing an awn from near the base on the back, the awn well exserted from the spikelet, bent about midway, twisted spirally below the bend; lemma of the upper floret with a minute awn from the back just below the tip and not exceeding the tip. 47. *Arrhenatherum*

44. Spikelets 2–3-flowered, florets bisexual; lemmas, if awned, the first short-awned, the second, in some spikelets at least, awned from between two long-acute apical lobes, the awn straight or divergent. 4. *Sphenopholis*

42. Lemmas not awned.

45. Glumes very dissimilar, the first linear, long-tapered, second much broader distally than at base, obovate if flattened out. 4. *Sphenopholis*

45. Glumes not dissimilar in the way described above.

46. Lower several lemmas of the spikelet empty, those subtending florets thus in the middle or upper part of the spikelet. 57. *Chasmanthium*

46. Lower lemmas subtending florets in at least some of the spikelets.

47. Lemmas 3-nerved, at least below, the nerves usually evident. 35. *Eragrostis*

47. Lemmas 5-or-more nerved, the nerves sometimes weak and difficult to discern.

48. The lemmas with the nerves parallel and straight, usually evident. 12. *Glyceria*

48. The lemmas with nerves often weak and difficult to discern, the lateral nerves arching-converging near the summit.

49. Glumes scarious or hyaline at least marginally. 2. *Poa*

49. Glumes not scarious, not hyaline. 1. *Festuca*

36. Spikelets 1-flowered or with 1 bisexual seed-producing floret, possibly a staminate, neuter or rudimentary floret below.

50. Spikelets with a small first glume or none (except in *Panicum gymnocarpon* in which first glume about as long as sterile lemma), second glume much larger and opposite a lemma of similar texture and usually of similar size (the sterile lemma) and appearing like a third glume, the sterile lemma empty or with a hyaline palea, rarely including a staminate floret, the one bisexual floret above these.

51. The spikelets of two dissimilar kinds, a smaller kind in the inflorescence on the aerial stems, these bisexual but presumably not seed-producing; a larger kind borne singly and terminally on slender subterranean branches and forming seeds cleistogamously. 26. *Amphicarpum*

51. The spikelets uniform and all in the inflorescence of the aerial stems.

52. Fertile lemma with thin-membranous or hyaline margins, not inrolled.

53. Inflorescence a narrow loose terminal panicle; second glume and sterile lemma prominently 5-ribbed, the ribs bearing spreading hairs. 14. *Anthaenantia*

53. Inflorescence of 3–5 slender spikelike racemes; sterile lemma 7-nerved, glabrous or pubescent along the margins. 13. *Digitaria*

52. Fertile lemma hard or indurate, the margins inrolled, not hyaline.

54. Sterile lemma apically cuspidate or awned. 22. *Echinochloa*

54. Sterile lemma neither awned nor cuspidate. 21. *Panicum*

50. Spikelets with 2 glumes, 1-flowered, floret bisexual; no sterile lemma below the floret.

55. Spikelets very strongly compressed laterally (the axis of the glumes perpendicular to or at an angle to the spikelet axis); glumes strongly keeled, with a strong lateral nerve on each side, exceeding the floret and hiding it; lemma hard and thick, pubescent with longish white hairs, completely surrounding and enclosing the palea and grain at maturity. 9. *Phalaris*

55. Spikelets not with the above combination of characters.

56. Lemma hard, much harder than the glumes and inrolled about the palea and the grain; awn 3-parted above. 46. *Aristida*

56. Lemma membranous or scarious, as soft as or not conspicuously harder than the glumes and not inrolled about the palea and grain; awn if present not 3-parted.

57. Disarticulation below the glumes, the spikelets falling entire.

58. Glumes awned. 7. *Polypogon*

58. Glumes awnless, lemmas awned.

59. Inflorescence spikelike, very dense and compacted. 10. *Alopecurus*

59. Inflorescence a diffuse panicle. 8. *Cinna*

57. Disarticulation above the glumes, thus the glumes remaining on the axis for a time after the mature florets fall.

60. Lemma awnless or awned from the back, loosely embracing the grain.

61. The lemma surrounded at base by a tuft of hairs arising from a basal callus and persistent on the lemma when it is detached.

62. Lemma awnless. 37. *Calamovilfa*

62. Lemma awned. 5. *Calamagrostis*

61. The lemma glabrous or pubescent but not subtended by a tuft of hairs.

63. Glumes equalling the lemma or longer. 6. *Agrostis*

63. Glumes shorter than the lemma. 39. *Sporobolus*

60. Lemma awned at the tip or mucronate, tightly embracing the grain. 38. *Muhlenbergia*

1. Festuca (FESCUES)

Tufted annuals and perennials with flat or involute leaf blades. Inflorescence open or contracted. Spikelets 3–several-flowered. Glumes narrow, keeled, unequal, 1–3 nerved.

Lemmas thin to firm, rounded on the back, awned from an entire or bifid apex, or awnless. Disarticulation is above the glumes and between the florets.

1. Leaf blades involute and setaceous, less than 1 mm wide; annual. 1. *F. octoflora*
1. Leaf blades flat, 1.5 mm wide or more; perennial.
  2. Branches of the panicle finely capillary, very flexuous, widely spreading; spikelets few near the ends of the ultimate branchlets, not overlapping. 2. *F. obtusa*
  2. Branches of the panicle slender-wiry but not finely capillary, stiffish, ascending; spikelets overlapping on the branchlets.
    3. Spikelets 8–12 mm long, usually 7–8 (–20) flowered; lemmas scarious apically, acuminate to awned. 3. *F. pratensis*
    3. Spikelets 5–6 mm long, mostly 3–4-flowered; lemmas green apically or with a narrow scarious margin, subacute. 4. *F. paradoxa*

1. **Festuca octoflora** Walt. SIX-WEEKS FESCUE. Fig. 44

Tufted annual. Stems usually numerous, erect or basally somewhat geniculate, 1–6 dm tall, glabrous. Leaf blades setaceous, involute, usually short, 2–15 cm long, about 0.5–0.8 mm wide, erect or ascending, much exceeded by most of the fully developed inflorescences. Inflorescence commonly with a single central axis, the short-stalked spikelets alternating, appressed and overlapping; sometimes with lateral branches of various lengths up to 5–6 cm long, these spreading or ascending, spikelets similarly disposed upon them. Spikelets very often 8-flowered, rarely more, or as few as 4–5 (lowermost spikelets often few-flowered); glumes subulate, somewhat unequal, both shorter than the lower lemmas, the first 1-nerved, the second 3-nerved basally; lemmas strongly incurved, smooth or scabrid on the back, tapering into a scabrid awn 1–6 mm long. (*Vulpia octoflora* (Walt.) Rydb.)

Mostly in open, well-drained places, fields, roadsides, open woodlands, but not infrequently on wet alluvial outwash. Throughout temp. N.Am.

Several annual fescues, similar in aspect to *F. octoflora*, occur in our range; they are, in our experience, very much more sporadic in occurrence, and we have not encountered them on wet sites.

2. **Festuca obtusa** Biehler. NODDING FESCUE. Fig. 44

Tufted perennial, stems slender, glabrous or sparsely pubescent, mostly 5–8 dm tall or a little more. Leaf blades flat, soft, the larger to about 10 mm wide, mostly much narrower. Panicle diffuse, the branches very finely capillary, flexuous, widely spreading. Spikelets relatively distant, stalked, not overlapping, disposed on upper ⅔ of ultimate branchlets, lanceolate, (1–) 2–3 (–5)-flowered, 4–5 mm long; glumes unequal, the second nearly as long as the lower lemma, the first shorter, both variable in width, smooth to scabrous on the keels, acute apically; lemmas smooth, obtuse to subacute.

Calcareous often rocky, well-drained woodlands, stream banks, floodplain forests. Que. to Man., generally southward to n. Fla., and e. Tex.

3. **Festuca pratensis** Huds. MEADOW FESCUE. Fig. 45

Relatively coarse tufted perennial. Stems 5–12 (–15) dm tall, glabrous. Larger leaf blades about 3–10 mm wide, flat, finely scabrous marginally and sometimes surficially. Panicles sometimes with all short lateral branches, sometimes with lower laterals to about 15 cm long overall and panicle 12–30 cm long; secondary or tertiary branches spikelet-bearing to or nearly to their bases, or the lower secondaries sometimes with naked stalks to about ⅓ their length. Spikelets stalked, 8–12 (–20) mm long, roughly oblong in outline, usually 7–8-flowered, but sometimes with fewer or more; glumes unequal, broadest at base, long-acute, first 1-nerved, second strongly 3-nerved; lemmas rounded on the back, obscurely nerved, scarious apically and acute to awned; if awned the awns to 2 mm long. (*F. elatior* of authors not L.; incl. *F. arundinacea* Schreb.)

Meadows, moist clearings and ditches, fields, waste places. Native to Eurasia. Cultivated for pasture and forage, widely naturalized in temp. N.Am.

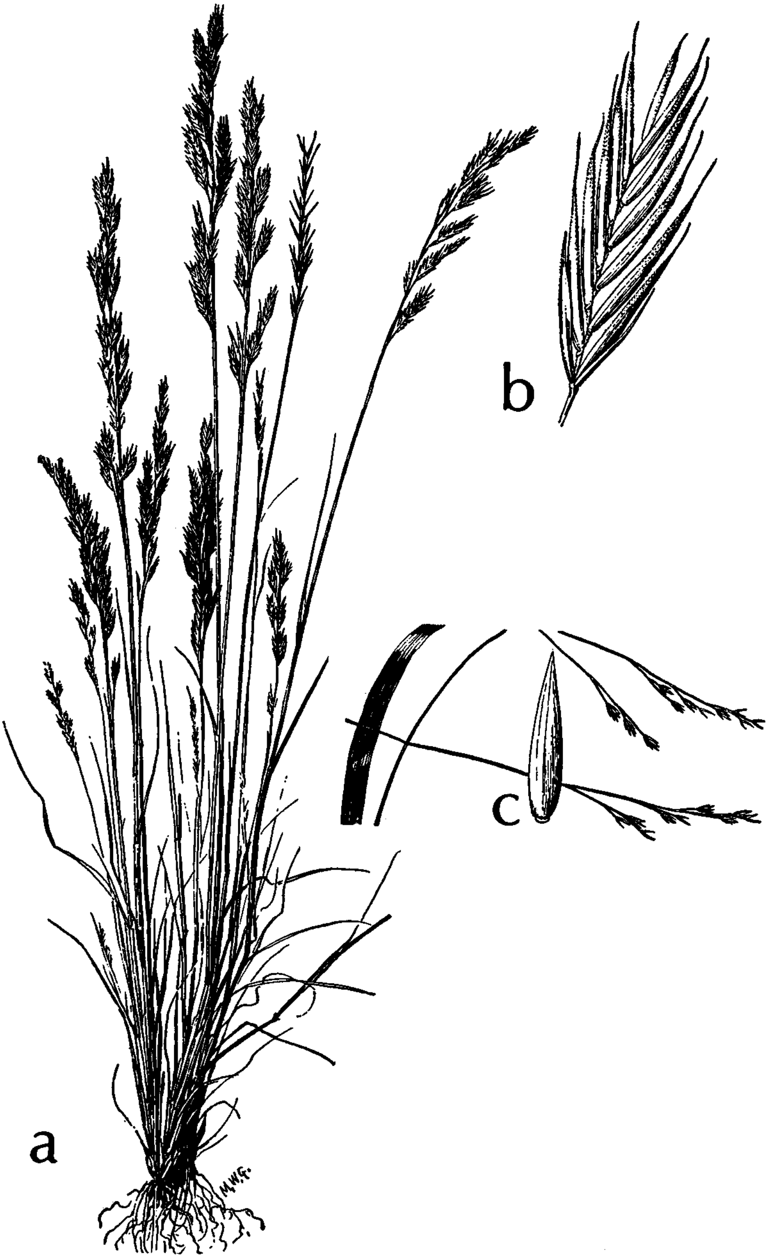


Fig. 44. a–b, **Festuca octoflora,** habit and spikelet; c, **Festuca obtusa,** portion of inflorescence and floret. (From Hitchcock and Chase)

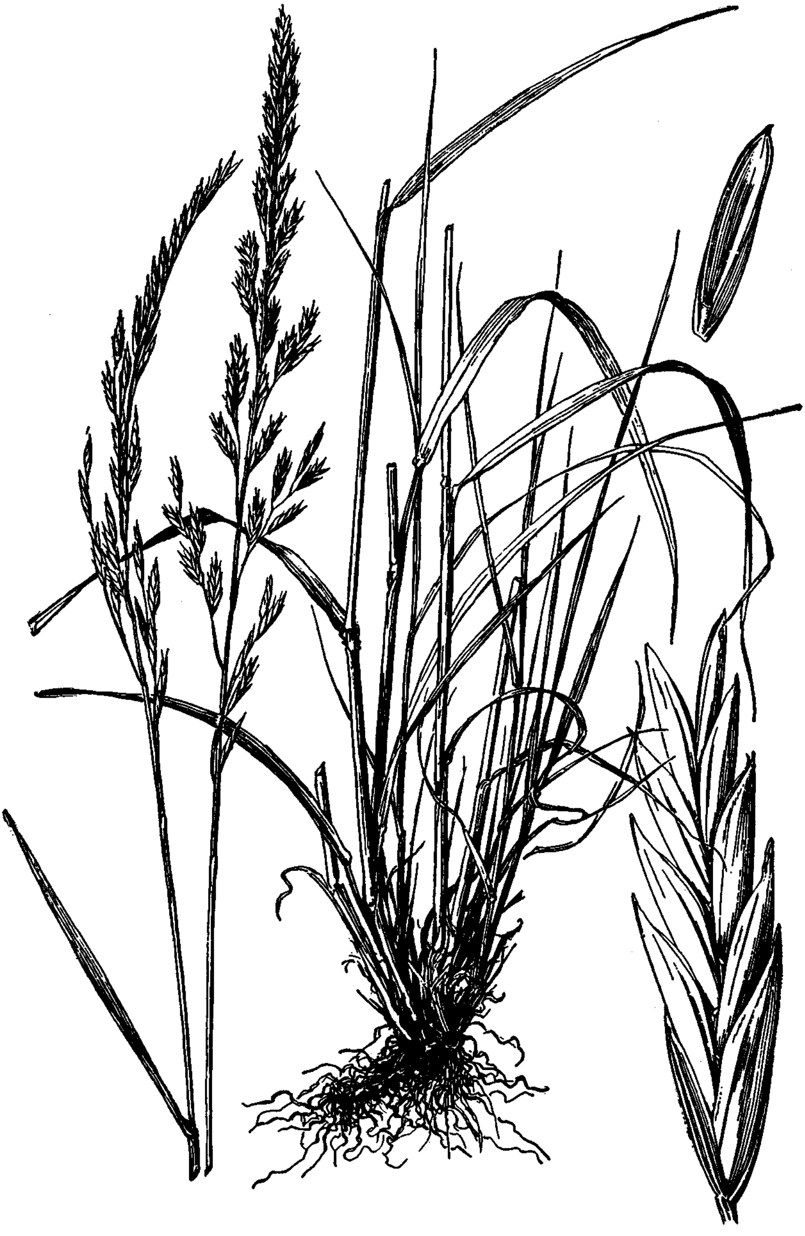


Fig. 45. **Festuca pratensis:** habit, spikelet and floret. (From Hitchcock and Chase)

4. Festuca paradoxa Desv.

Tufted perennial. Stems 5–11 dm tall, glabrous. Leaf blades 4–8 (–10) mm wide, marginally barely scabrous. Panicles with ascending branches, the lower secondaries and tertiaries naked below, spikelet-bearing in about the upper half. Spikelets short-stalked, mostly overlapping, 5–6 mm long; glumes unequal, the first 1-nerved, subulate, shorter than the second, second strongly 3-nerved, broader, both scabrid on the nerves; lemmas green apically or with narrow scabrous margins, subacute. (*F. shortii* Kunth)

Floodplain forests, open grassy depressions, mesic woodlands. E. Pa. to Va., w. to Ind., Ill., Wis., Iowa, generally s. to Ga., Ala., and e. Tex.

2. Poa (BLUEGRASSES)

Annual or perennial with relatively slender simple stems and narrow leaf blades ending in somewhat of a hoodlike tip. Inflorescence paniculate, in most loose and open. Spikelets 2–several-flowered, somewhat flattened laterally, uppermost floret staminate or rudimentary. Glumes keeled, usually unequal, first 1–3-nerved, second 3-nerved. Lemmas usually keeled, not hard, normally 5-nerved but the lateral nerves not always evident; in many species a tuft of longish cottony hairs at the base of the lemma (besides whatever other pubescence may be on the lemma). Disarticulation is above the glumes and between the florets.

Besides the species of *Poa* treated below which inhabit natural wetlands in our range (although *P. annua* is perhaps mostly weedy), there are several other introduced kinds which are widely naturalized and sometimes occur in marginally wet places, especially on farmlands and in disturbed and waste places.

1. Tufted annual characteristically producing 1–several spreading to erect flowering stems very early in the season, the tuft densely proliferating as the season advances then forming numerous flowering stems usually of very unequal stature, varying from about 5 to 30 cm long. 1. *P. annua*

1. Tufted perennials, in general the flowering stems much taller and usually developing more or less concurrently over a shorter period.

  2. Branchlets of the panicle floriferous only distally; tuft of cottony hairs not present at base of lemma although lemma usually otherwise pubescent. 2. *P. autumnalis*

  2. Branches of the panicle floriferous for the entire length or at least the upper half; tuft of cottony hairs present at base of lemma.

    3. Second glume with barely (if at all) discernible lateral nerves. 3. *P. sylvestris*

    3. Second glume with markedly discernible lateral nerves. 4. *P. trivialis*

1. Poa annua L. SIX-WEEKS GRASS. Fig. 46

Tufted annual, commencing to form flowering stems very early in the season, the tuft gradually densely proliferating and forming numerous flowering stems as the season advances. Stems of varying lengths from 5–30 cm. Leaf blades narrow, 0.5–1.5 mm wide, variable in length to about 10 cm. Panicles open, to about 6–7 cm long. Spikelets 2–6-flowered, 3–7 mm long; glumes unequal, first 1-nerved, second 3-nerved; lemmas glabrous, the margins narrowly hyaline below, becoming gradually more widely hyaline distally, the tip hyaline, with or without a tuft of cottony hairs at the base, glabrous or variously pubescent, i.e., on the back, on the nerves, or marginally. (Incl. *P. chapmaniana* Scribn.)

In a wide range of places, rather weedy; not infrequently in alluvial woods after flooding, in clearings, roadsides, lawns, fields. Native in Europe, widely naturalized, Nfld. to Alaska, U.S.; trop. Am. at higher elevations.

2. Poa autumnalis Muhl. ex Ell.

Tufted perennial. Stems 5–10 dm tall. Leaf blades to about 2 dm long, 1–3 mm wide. Panicle diffuse, the branches mostly opposite, capillary, flexuous, branchlets floriferous distally. Spikelets on capillary stalks 2–8 mm long, 2–6 flowered, (4–) 5–8 mm long; first glume 1-nerved, rarely 3-, lance-subulate, second 3-nerved, broadest below, narrowed

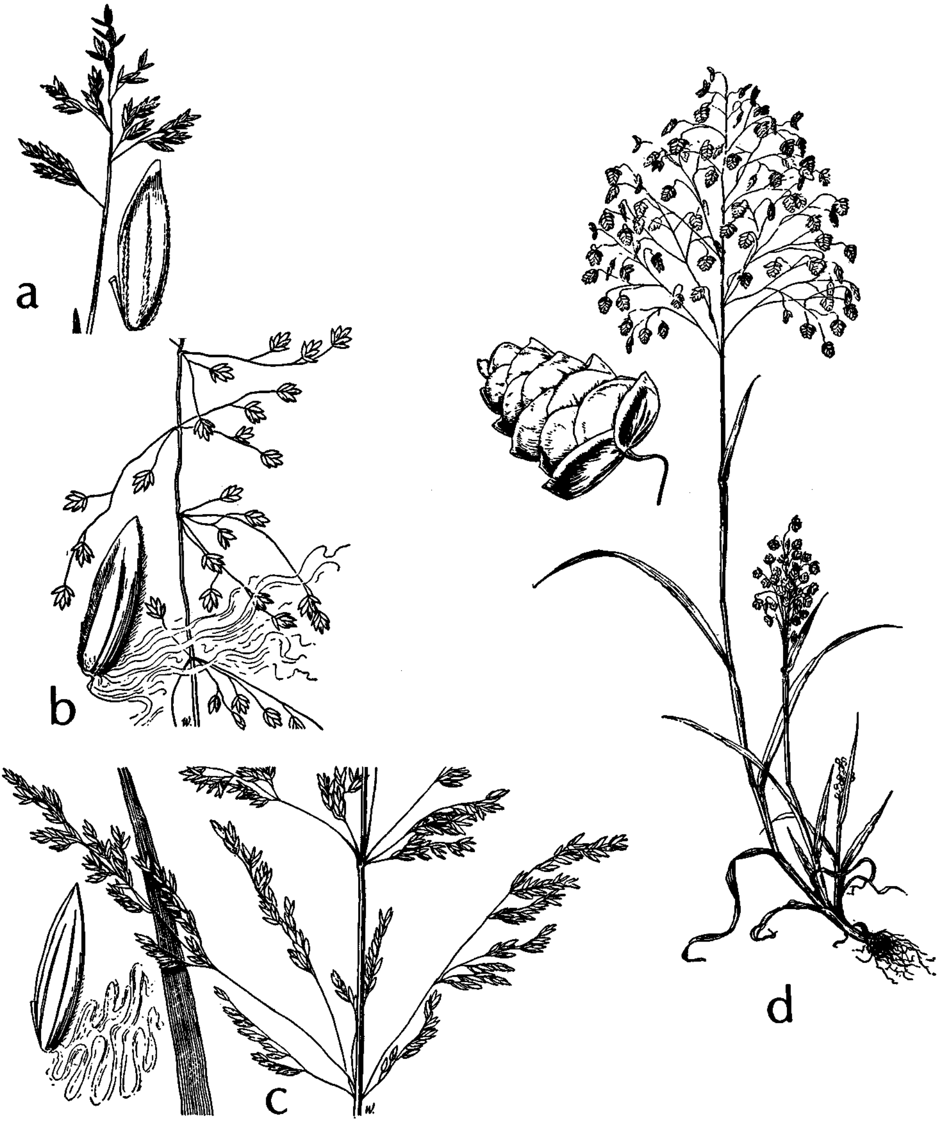


Fig. 46. a, **Poa annua,** panicle and floret; b, **Poa sylvestris,** portion of panicle and floret; c, **Poa trivialis:** portion of panicle and floret; d, **Briza minor,** habit and spikelet. (From Hitchcock and Chase)

abruptly ⅔ of the way from the base, both with hyaline margins and scabrous keels; lemmas with a basal tuft of cottony hairs, usually pubescent on the keel and on the margins.

Floodplain forests, banks of woodland streams, seepage areas in woodland, clearings adjacent. N.J. to Mich. and Ill., s. to n. Fla., e. and s.e. Tex.

3. Poa sylvestris Gray. Fig. 46

Tufted perennial. Stems 5–8 dm tall. Leaf blades 5–30 cm long, 1–5 mm wide. Panicles open, 8–15 cm long, mostly pyramidal, the main branches 3–5 per node, unequal in length, capillary, flexuous, floriferous in about the distal half. Spikelets 3–4 mm long, on capillary stalks 2–5 mm long, 2–4 flowered, first glume 1-nerved, second with barely discernible lateral nerves or none, smooth, or one or both scabrous on the keels distally, apically acute, margins hyaline; lemmas with a basal tuft of cottony hairs, pubescent on the margins.

Rich moist woodlands, rocky woodlands, sometimes bottomland woods. N.Y. to Wis., Iowa, Kan., generally southward to S.C., Ala., La.

4. Poa trivialis L. ROUGH BLUEGRASS. Fig. 46

Tufted perennial. Stems 5–10 dm tall. Leaf blades to 2 dm long, 2–3 (–5) mm wide; minutely scabrous on both surfaces. Panicle open, 6–20 cm long, pyramidal, branches capillary, mostly 3–several per node (except the upper nodes), branchlets floriferous in the upper half or to or nearly to the base. Spikelets mostly overlapping on the branchlets, on short thickish stalks, mostly 2–3 flowered, 3–4 mm long; second glume very perceptibly 3-nerved, both glumes acute apically, with hyaline margins, scabrous on the keels distally; lemmas with a tuft of cottony hairs basally, glabrous except for scabrid or silky-pubescent keel.

Floodplain forests, springy seepage areas in woodland, banks of woodland streams, thickets. Nfld. to Ont. and Minn., s. to N.C., Ky., Ill.; Wash. to n. Calif.

3. Briza

Briza minor L. QUAKING GRASS. Fig. 46

A handsome little annual tufted grass. Stems of variable stature, 1–6 dm tall. Leaf blades flat, 5–10 mm wide, very finely scabrid on the margins. Panicle open, wide-spreading and diffuse, very variable in overall outline size; branching trichotomously and dichotomously, branches capillary, flexuous. Spikelets 3–5 mm long on capillary flexuous stalks to 10 mm long, somewhat dilated distally, often pendulous, broadest and truncate at base, somewhat tapering to a truncate apex, broader than long, 3–8 flowered, flattish; glumes spreading at right angles from the axis, broadly obovate, boatlike, with a rounded green nerved back and broadly hyaline margins; lemmas similar, the lower longest, progressively smaller upwards. Disarticulation is above the glumes and between the florets.

The broad flat spikelets on capillary flexuous stalks are subject to vibrating in the wind hence the common name.

In a wide range of open habitats, some moist to wet, clearings of bottomland woods, swales, ditches, alluvial outwash, moist roadsides, fallow fields. Native in Europe, introduced and widely naturalized, sporadic in occurrence.

4. Sphenopholis (WEDGEGRASSES)

Tufted annuals or perennials. Stems, leaf sheaths and blades glabrous or pubescent, blades of lower leaves much exceeded by the shining panicles. Spikelets disarticulating below the glumes; 2-3-flowered; glumes unequal; lemmas rounded on the back, obtuse, acute, or awned from just below the tip; palea hyaline, shorter than the lemma; axis of the spikelet slightly prolonged beyond the upper floret.

- Spikelets without awns. 1. *S. obtusata*
- Spikelets with some lemmas awned. 2. *S. pennsylvanica*

1. Sphenopholis obtusata (Michx.) Scribn. Fig. 47

Tufted annual or perennial. Stems 2–12 dm tall, glabrous or pubescent, the blades flat, 2–5 (–8) mm wide, the lower ones usually not exceeding 10 cm long. Inflorescence a terminal panicle, 5–25 cm long, variable in density from narrow, congested and spikelike to loose and open. Spikelets mostly about 3 mm long, 2–3-flowered; first glume keeled, much narrower than the second, linear, long-tapered, usually scabrid on the keel its entire length, sometimes only distally; second glume more or less boatlike, much broader distally than at base, thus obovate if flattened out in the mind's eye, the apex broadly rounded (rarely obtuse or acute), very abruptly narrowed at the very tip to a soft apiculation, the keel scabrid throughout or at least distally.

Exposed pond margins, borders of marshes, stream banks, moist roadsides, prairies, moist fallow fields, sometimes in well-drained woodlands. S. Maine to B.C., generally southward throughout U.S.; Mex.; Berm., Hisp.

S. obtusata is a very variable species, especially in respect to attributes of inflorescence and spikelets. Authors have recognized it as comprised of several species and varieties. For a recent analysis see Erdman, K. S. (1965).

2. Sphenopholis pennsylvanica (L.) Hitchc. Fig. 47

Tufted perennial. Stems mostly 5–8 dm tall, sometimes to 12 dm; nodes and internodes glabrous. Leaf sheaths and blades usually glabrous, occasionally pubescent; blades flat, to 20 cm long, usually 10–12, 2–6 mm wide, flexuous. Panicle loose and open, 6–25 cm long. Spikelets (4–) 5–7 mm long, excluding awns, usually 2-flowered; glumes unequal, the first somewhat narrower and shorter than the second, keeled, acute to acuminate, the keels minutely scabrid to smooth; first lemma acute, rarely short awned, the second, in some spikelets at least, awned from between two long-acute apical lobes, the awn straight or divergent, 3.5–7 mm long. (*Trisetum pennsylvanicum* (L.) Beauv. ex R. & S.)

Wet or swampy woodlands, wet clearings, adjacent ditches and roadsides, banks of small streams, boggy places. Mass. to Ohio, s. to n. Fla., and La.

5. Calamagrostis

Calamagrostis cinnoides (Muhl.) Barton. REEDGRASS. Fig. 48

Glaucous perennial with short, slender rhizomes. Stems relatively stout, 9–12 dm tall, striate, mostly solitary. Leaf blades flat, 4–5 dm long, 5–10 mm wide, blades and sheaths scabrous, sometimes sparsely hirsute. Panicle erect, rather dense, the outline oblong to narrowly pyramidal and commonly lobulate, the lateral branches being of uneven length, mostly 1–2 dm long and (1–) 2–4 cm broad, the branchlets usually floriferous to the base or nearly so. Spikelets usually purple-tinged, 6–7 mm long; glumes longer than the lemmas, giving the length of the spikelets, strongly keeled, nearly equal, first 1-nerved; callus at base of lemma copiously bearded, the hairs in a basal tuft and with a second stalked tuft on one side, the hairs about ⅔ as long as the lemma; lemma apically bifid, an awn 1–2 mm long from the notch.

Pine savannas, open bogs, shrub bogs, wet woodlands. N.S. and N.E., generally southward to Va., Ky., thence to Ga. and La.

6. Agrostis (BENTGRASSES)

Perennial (ours), relatively slender. Leaf blades flat, scabrous. Spikelets 1-flowered, small, in ours in open panicles. Glumes thin, lanceolate, nearly equal, the first usually 1-nerved, the second 1- or 3-nerved. Lemma thin, broad, 3–5-nerved, acute, obtuse or truncate apically, awnless or awned from the middle of the back or below. Palea small or absent. Disarticulation is above the glumes.

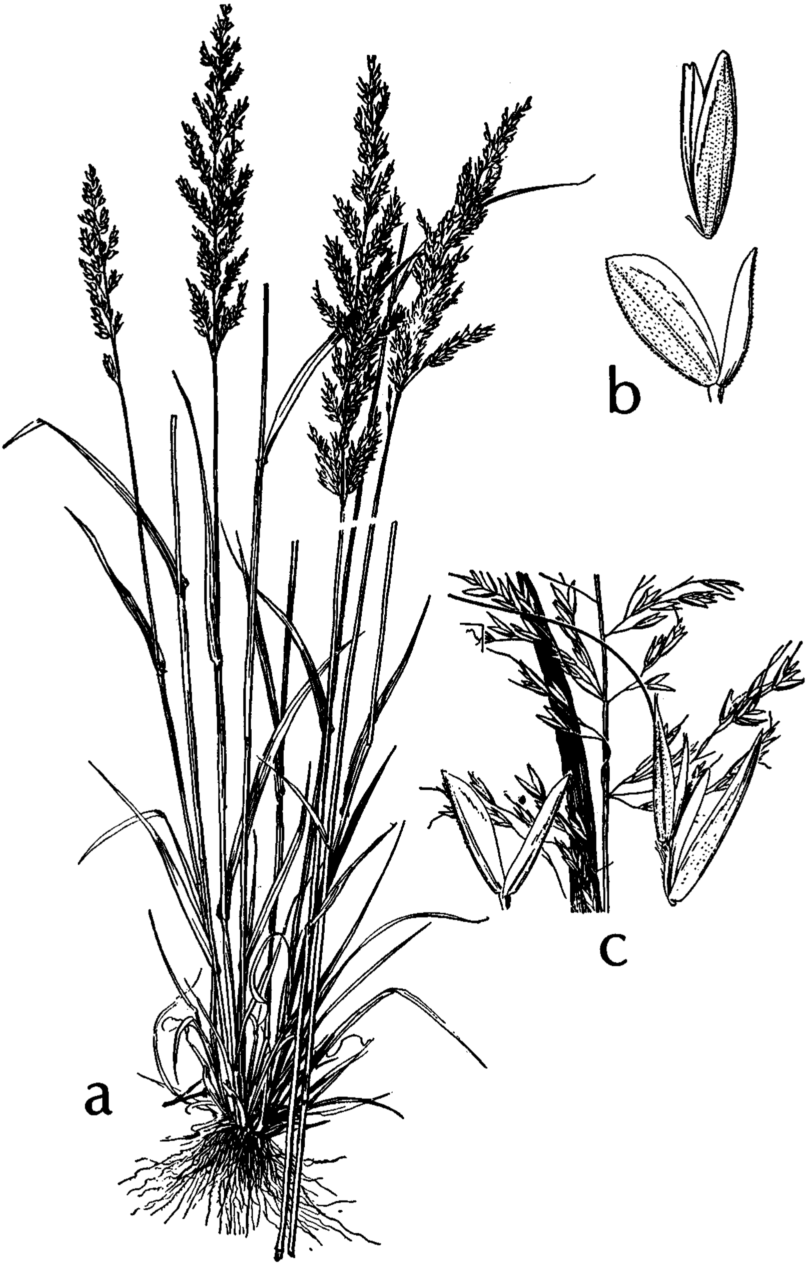


Fig. 47. a–b, **Sphenopholis obtusata:** a, habit; b, glumes and floret; c, **Sphenopholis pennsylvanica:** portion of panicle, glumes and floret. (From Hitchcock and Chase)

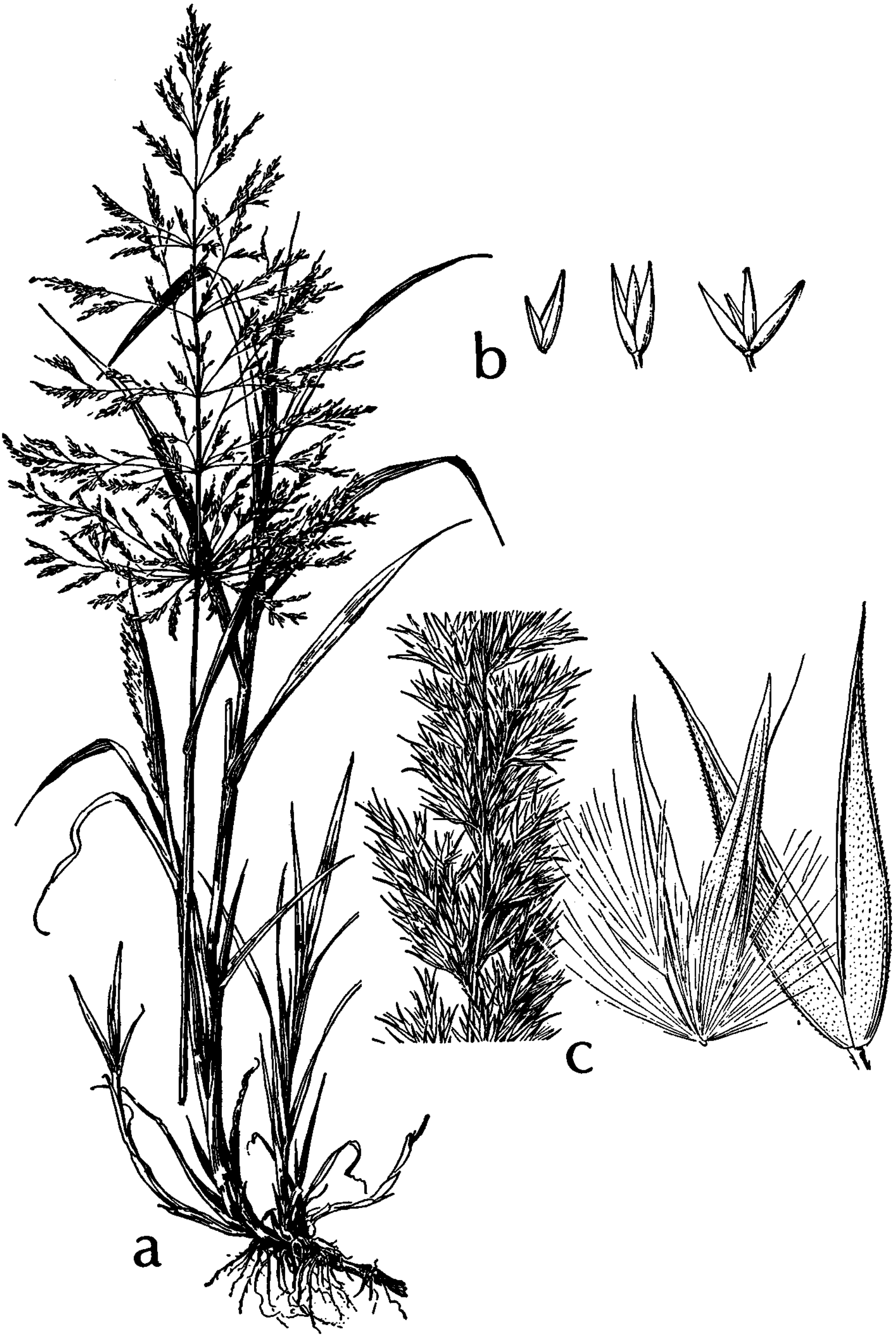


Fig. 48. a–b, **Agrostis stolonifera:** a, habit; b, glumes and florets; c, **Calamagrostis cinnoides**: portion of panicle, floret and glumes. (From Hitchcock and Chase)

Some kinds of bent grasses are important economically, used as forage plants and for lawns, sports turf, especially in cooler regions. Species and cultivar selections have been introduced from Europe; some, perhaps most, are naturalized and taxonomic treatments differ considerably. We restrict ourselves here to the three kinds, two of them native, most likely to be encountered in our wetlands.

1. Principal panicle branches floriferous from near the base, at least some of them. 1. *A. stolonifera*
1. Principal panicle branches not floriferous near the base.
  2. Panicle branches forking at about the middle or just below; spikelets loosely disposed on the ultimate branchlets; flowering in late summer or autumn. 2. *A. perennans*
  2. Panicle branches forking well above the middle; spikelets disposed rather closely near the ends of the ultimate branchlets; flowering in spring or early summer. 3. *A. hiemalis*

1. Agrostis stolonifera L. REDTOP. Fig. 48

Perennial with short rhizomes, usually tufted. Stems glabrous, erect, 3.5–10 dm tall, leafy. Leaf blades to 2 dm long, 2–8 mm wide, commonly 3–5 mm long, finely scabrid on the surfaces and margins. Panicle open, 12–25 cm long, somewhat less than half as broad, more or less pyramidal; principal branches verticillate except near the narrower summit, spreading-ascending, some of them floriferous near the base. Spikelets 2–3 mm long, on stalks of varying lengths from subsessile to about 3 mm long, lanceolate, not awned; glumes as long as the spikelet, equal, apically acute, usually reddish-purple, sometimes green; lemmas about as long as glumes and palea about ⅔ as long as lemma. (Incorrectly referred to *A. alba* L.)

Wet meadows, stream banks, damp clearings, roadsides, fields and pastures, marshes. Widespread in temp. N.Am.

2. Agrostis perennans (Walt.) Tuckerm. AUTUMN BENTGRASS.

Plants tufted. Stems glabrous, slender, leafy, weak, often sprawling, especially in shade. Leaf blades narrow, 5–20 cm long, mostly 1–3 mm wide, finely scabrid on the margins. Panicles diffuse (more so in shade than in sun), the branches capillary, flexuous, verticillate below, the principal branches rebranched near the middle, loosely floriferous toward the ends of the finely capillary ultimate branchlets. Spikelets 2 mm long or slightly longer, on stalks from 1–4 (–5) mm long; first glume somewhat longer than the second, a little exceeding the lemma thus giving the length of the spikelet, both acuminate to slightly aristate; lemma rarely awned. Flowering in late summer or autumn.

Floodplain forests, river and stream banks, wet meadows, marshes. N.S. and Que. to Minn., generally southward to n. Fla., Okla., e. Tex.; N.Mex.; Mex.

3. Agrostis hiemalis (Walt.) BSP. SPRING BENTGRASS, TICKLE GRASS. Fig. 49

Tufted perennial. Stems erect, slender, glabrous. Leaf blades flat, setaceous, to about 1 mm wide. Panicle diffuse, verticillate below, the principal branches rebranched above the middle, finely capillary and flexuous, rather closely floriferous at the tips of the ultimate branchlets. Spikelets about 1.5–1.8 mm long, lanceolate, subsessile or short-stalked; glumes longer than the lemma thus giving the length of the spikelet, the first somewhat longer than the second, apically long-acute, acuminate, or slightly aristate; glumes gaping at maturity. Flowering in spring and early summer, later at higher elevations.

Plants with somewhat longer spikelets, 2–2.7 mm long, the glumes not gaping at maturity, somewhat more robust in stature and usually flowering somewhat later, may be referred to *A. scabra* Willd., if considered to be specifically distinct; or to *A. hiemalis* var. *tenuis* (Tuckerm.) Gl. if considered to be varietally distinct.

Usually in moist sandy soil, usually in open places, fallow fields, roadsides, clearings, exposed shores of ponds, generally rather weedy. Widespread in the U.S.

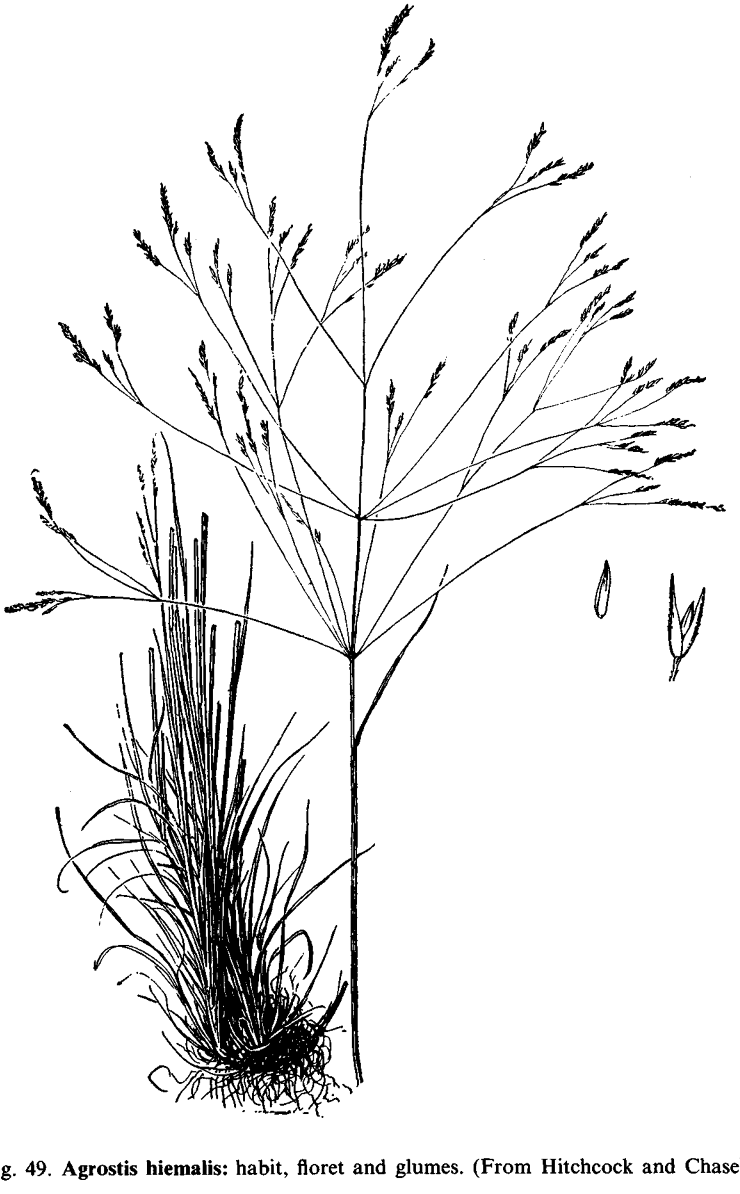


Fig. 49. **Agrostis hiemalis:** habit, floret and glumes. (From Hitchcock and Chase)

7. Polypogon

Polypogon monspeliensis (L.) Desf. RABBITFOOT GRASS. Fig. 50

Tufted annual, often bent at the nodes on the lower part of the stem; variable in stature, occasionally diminutive, usually about 5–7 dm tall. Leafy below the inflorescence; sheaths and blades striate, minutely papillose-scabrid on the striations (both surfaces of the blades); blades flat, 4–15 cm long, 1–7 mm wide. Inflorescence a softish but bristly panicle, very dense and comprised of a very large number of spikelets (except in diminutive specimens). Spikelets 1-flowered; glumes subequal, pubescent, much longer than the lemma and palea thus giving the length to the spikelet, 2 mm long (excluding the awns), at the summit 2-lobed, ciliate on the margins and lobes, each glume with an awn 1–1.5 mm long borne from between the lobes. Disarticulation is below the glumes.

Moist to wet, fresh to brackish, open places, ditches, clearings, alluvial bars, pond margins, disturbed soils. Native in Europe. Widely naturalized in W. Hemis. though of sporadic occurrence.

8. Cinna

Cinna arundinacea L. WOODREED. Fig. 51

Perennial with hard often bulblike caudex. Stems solitary or few in a tuft, mostly 1–1.5 m tall, leafy. Leaf sheaths glabrous, the blades flat, striate, elongate, 1.5–3.5 dm long, 3–15 mm wide, surfaces glabrous, margins very, very finely scabrid. Ligule an auriculate scale. Inflorescence a diffuse panicle 1–3 dm long and 1.5 cm broad, the branches filiform-flexuous, usually ascending, the spikelets approximate on the ultimate branches. Spikelets 4–6 mm long, flat, the parts keeled, 1-flowered; glumes somewhat unequal, the longer nearly as long as the spikelet, margins hyaline, keels very finely scabrid; lemma similar, a little longer than longer glume, bearing a very tiny awn from just back of the tip. Disarticulation is below the glumes.

River and stream banks, wet woodlands, boggy-marshy places, wet meadows, shores of sluggish streams. Maine and s.w. Que. to Ont. and Minn., generally southward to Ga., e. Okla. and e. Tex.

In our range, only in the highlands of the s. Appalachians, a second species, *C. latifolia* (Trev.) Griseb., occurs. It is similar, usually has wider leaves, more open panicle with spreading-drooping branches, fewer less densely disposed spikelets (Fig. 51).

9. Phalaris (CANARY GRASSES)

Annuals or perennials, the stems erect, leaf blades flat, inflorescence terminal, narrow and spikelike to ovoid-capitate, the spikelets very numerous, densely compacted. Spikelets compressed laterally, the axis of the glumes perpendicular to or at an angle to the axis; with one fertile floret having persistently attached basally on one or both sides an awnlike or scalelike structure, that is, sterile lemma representing the remains of sterile florets. Glumes subequal, strongly keeled with a strong lateral nerve on each side, the glumes exceeding the fertile floret, giving the length of the spikelet, and hiding the floret. Lemma hard and thick, acuminate, pubescent with longish white upwardly appressed hairs, the lemma completely surrounding and enclosing the palea and grain at maturity. Mature fertile floret, "fruit," falls entire with the sterile lemmas attached, disarticulation being above the glumes.

1. Plant a rhizomatous perennial; inflorescence lobulate-branched, the dense branches spreading-ascending. 1. *P. arundinacea*
1. Plant a tufted perennial; inflorescence not lobulate-branched, spikelike (sometimes interrupted-spikelike).
  2. Glumes 3.5–6 mm long; inflorescence long-cylindrical, elliptic or lanceolate in outline.
    3. Inflorescence long-cylindrical, though sometimes interrupted, 6–18 cm long and 1–1.5 cm broad; glumes 3.5–4.0 mm long. 2. *P. angusta*

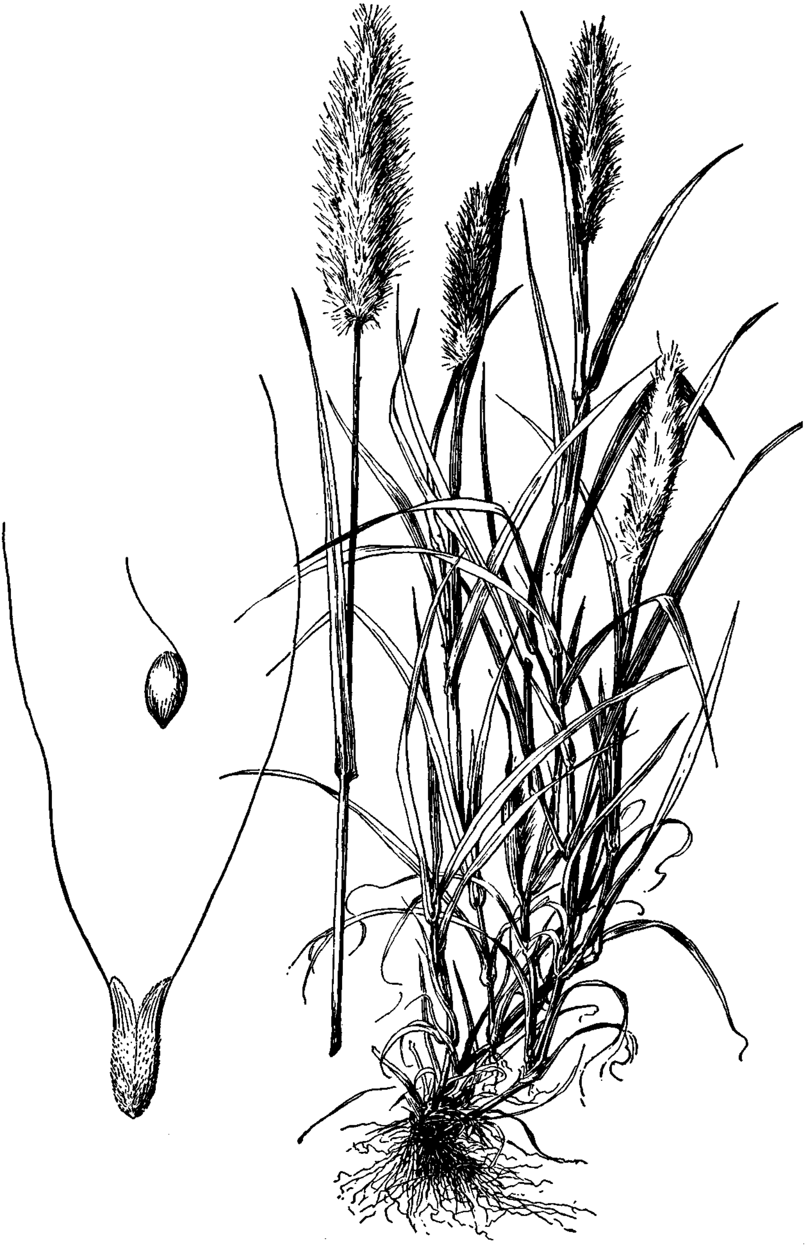


Fig. 50. **Polypogon monspeliensis:** habit, glumes and floret. (From Hitchcock and Chase)

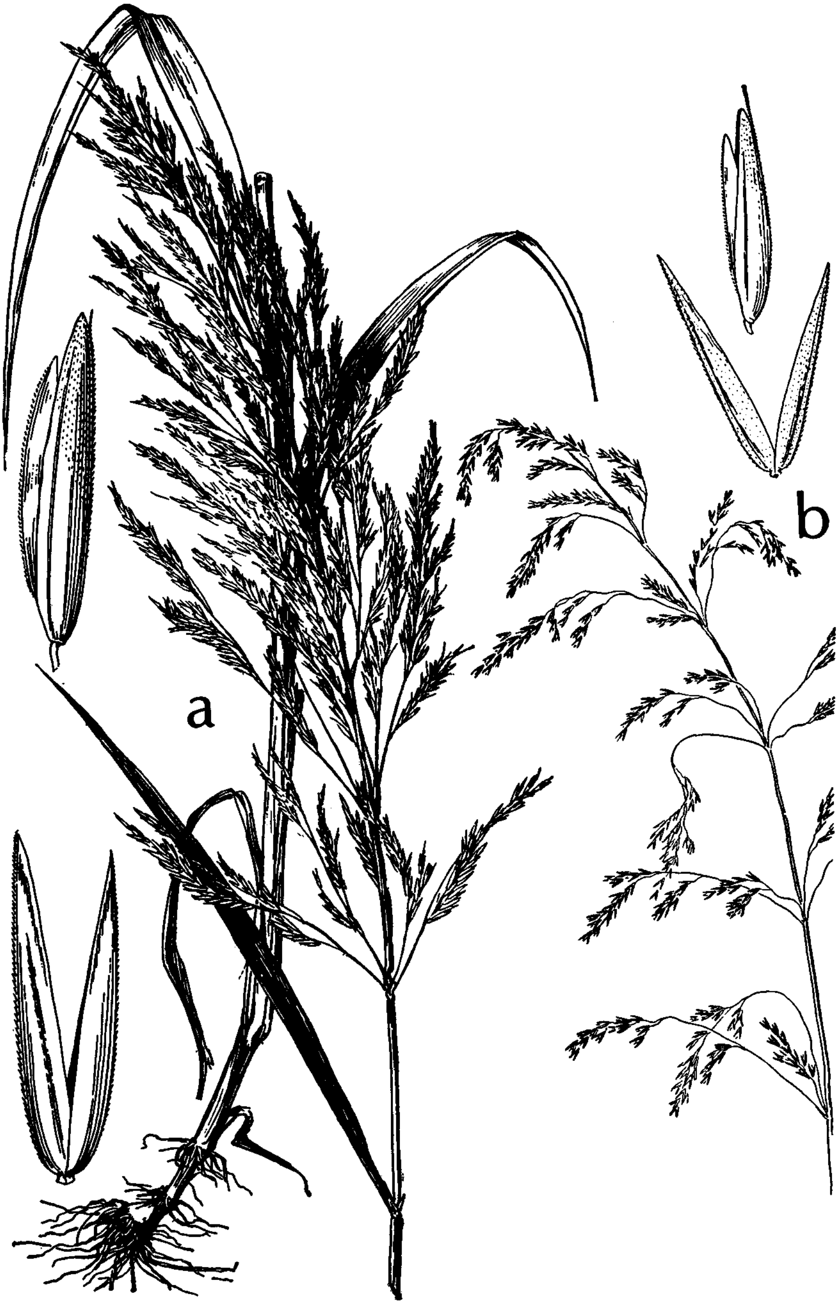


Fig. 51. a, **Cinna arundinacea:** habit, glumes and floret; b, **Cinna latifolia:** panicle, glumes and floret. (From Hitchcock and Chase)

3. Inflorescence 2–6 cm long and 1–1.6 cm broad; glumes 5–6 mm long. 3. *P. caroliniana*
2. Glumes 7–8 mm long; inflorescence ovate. 4. *P. canariensis*

1. Phalaris arundinacea L. REED CANARY GRASS. Fig. 52

Rhizomatous perennial, glaucous. Stems somewhat decumbent basally and rooting at the nodes, 6–15 dm tall, glabrous. Leaf blades 5–12 mm wide, glabrous or scabrous. Panicles mostly 10–15 cm long, lobulate-branched, sometimes the low branches with naked stalks, usually floriferous throughout. Spikelets about 5 mm long; glumes in side view lanceolate, acuminate apically, scabrous on the keel at least distally; "fruit" 3–3.5 mm long, lanceolate, yellowish, sterile lemmas minute scales.

Marshes, sloughs, stream banks, swamps, ditches. Nfld. to Alaska, generally southward to w. N.C., Ky., Mo., N.Mex., Ariz., Calif.; Euras.

2. Phalaris angusta Nees ex Trin.

Tufted annual. Stems erect, 5–15 dm tall, glabrous. Leaf blades 5–10 mm wide, minutely scabrous above and marginally. Panicle essentially cylindric, sometimes interrupted, 6–15 cm long and 1–1.5 cm wide. Spikelets 3.5–4.0 mm long; glumes in side view linear-oblong, more or less falcate, narrowly winged, abruptly pointed apically, keel and lateral nerves sharply scabrous; "fruit" lance-ovate, yellowish, the sterile lemmas narrow hairy scales, appressed to the "fruit," reaching somewhat less than half its length.

Open wet areas, mainly ditches, bayous. Introduced, sporadically naturalized, Fla., Miss., La., Tex., Ariz., Calif., S.Am.

3. Phalaris caroliniana Walt. Fig. 52

Tufted annual. Stems 2–10 dm tall, glabrous. Leaf blades 5–10 mm wide, the surfaces finely scabrous. Panicle very compact, elliptic or lance-elliptic in outline, 2–6 cm long and 1–1.5 cm broad. Spikelets 5–6 mm long; glumes in side view lance-oblong, more or less falcate, narrowly winged, apically acuminate, very finely scabrid on the keel; "fruit" ovate, brown, about 3 mm long, the narrowly elliptic scalelike sterile lemma appressed to its sides, reaching about half its length.

Open moist to wet places, alluvial floodplains, along streams, ditches, fallow fields. Sporadic and locally abundant, Md., Va., N.C. to n. Fla., generally westward to Nev. and Calif.

4. Phalaris canariensis L. CANARY GRASS. Fig. 52

Similar in aspect to the preceding, the compact panicle ovoid, 2–4 cm long. Spikelets 7–8 mm long; glumes in side view, nearly obovate, broadly winged distally, pale, smooth or with a very few longish hairs surficially, the edge of the wing very very finely toothed; "fruit" 5–6 mm long, narrowly ovate, light brown, the sterile lemma lanceolate, loosely appressed to its sides, reaching fully half its length.

Waste places. Introduced from Europe, sporadically weedy more or less throughout the U.S.

10. Alopecurus

Alopecurus carolinianus Walt. FOXTAIL.

Tufted annual, often mat-forming, with erect stems, flat leaf blades and very dense compacted spikelike cylindrical inflorescences. Stems 1–5 dm tall, glabrous, nodes purplish. Leaf blades variable in length, to about 12 cm long, 0.5–1.0 mm wide, the upper sheaths somewhat inflated. Inflorescence 2–5 cm long, about 5 mm wide not including the awns. Spikelets on stalks 1 mm long or a little longer, 1-flowered, 2–3 mm long excluding awn; glumes equal, thin-scarious or green distally, as long as the spikelet, united at the very base, conspicuously ciliate on the keels, that is, at the margins of the laterally flattened spikelet, apically acute to short-soft-aristate; lemmas thin, somewhat shorter than glumes, awned from the back below the middle, awn extruded from the

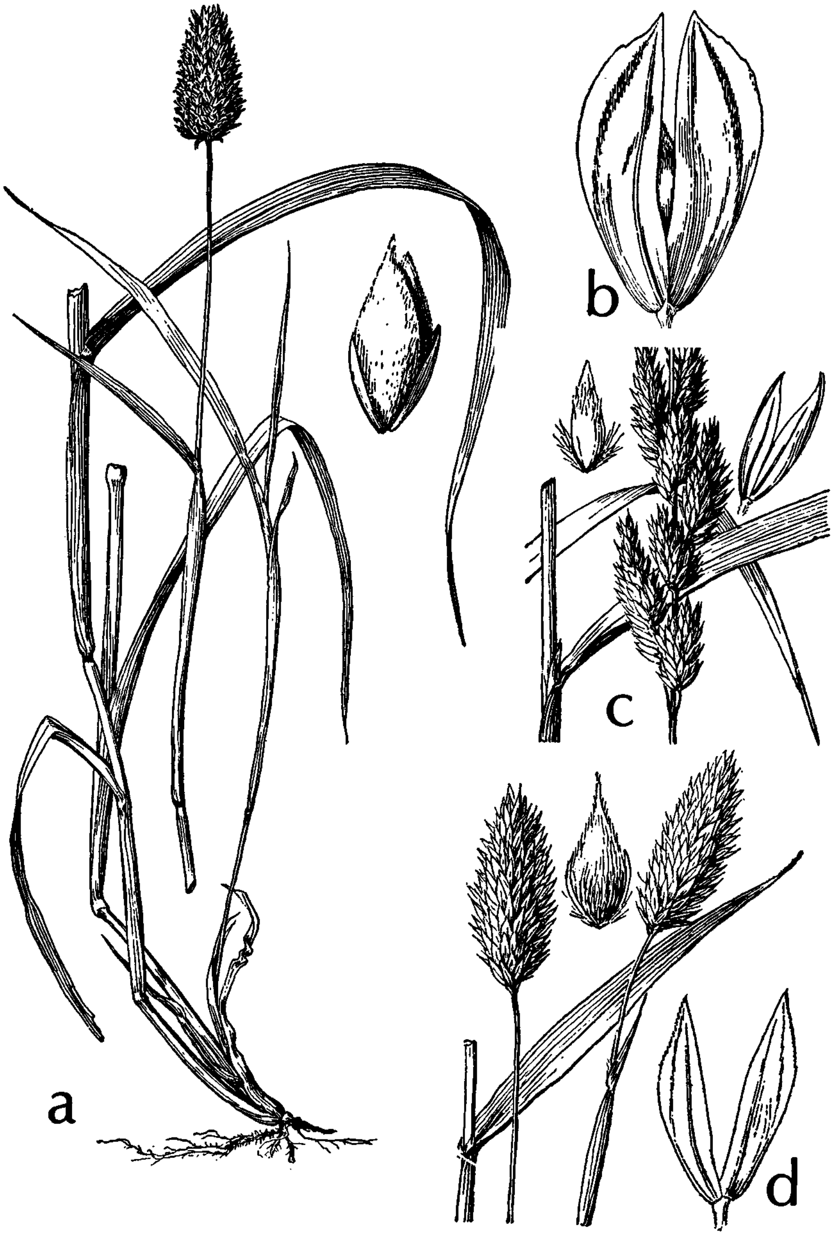


Fig. 52. a–b, **Phalaris canariensis:** a, habit and spikelet; b, floret; c, **Phalaris arundinacea:** portions of plant, glumes and floret; d, **Phalaris caroliniana:** portions of plant, glumes and floret. (From Hitchcock and Chase)

spikelet and diverging from the inflorescence 2–3 mm. Disarticulation is below the glumes. (*A. ramosus* Poir.)

Moist to wet open places, fallow fields, shores of ponds and lakes, meadows, wet clearings of floodplain woodlands, ditches. N.J. to B.C., generally southward in the U.S. to n. Fla. and Calif.

11. Elymus (WILD-RYES)

Tufted perennials. Leaves disposed rather evenly on the stem, the blades flat, auricles present on either side at the juncture of sheath and blade. Inflorescence spicate, the axis conspicuously jointed, bearing pairs of spikelets (sometimes one or three or more) at the nodes, the axes of the spikelets basally somehow distorted so that the glumes of each of the pair are on one side of the spikelet, the side away from the axis of the spike. Spikelets (1–) 2–6-flowered, the upper ones imperfect; glumes nearly equal in length, somewhat asymmetric, firm to rigid, sometimes very hard basally, lanceolate to subulate, 1–several-nerved, the principal nerve often off-center, apically acute to awned, the glumes disposed at the base of the spikelet somewhat below the lowermost floret thus involucrelike; lemmas rounded on the back, obscurely if at all nerved below, usually awned; palea enclosed by the lemma. Disarticulation is above the glumes and between the florets.

There is a considerable variability in *E. virginicus* and *E. canadensis,* especially the former. In parts of the range they may occur together; there is integradation between them. The treatment below is doubtlessly more stereotyped than the plants warrant; in devising it we despaired of achieving more than generalized concepts.

1. Glumes with hard terete, smooth yellowish bases which are bowed outward forming a rounded V or U between. 1. *E. virginicus*
1. Glumes with bases that do not bow-out, diverging gradually forming a narrow angle between.
    2. Joints of spike, glumes and lemmas villous. 2. *E. villosus*
    2. Joints of spike, glumes and lemmas smooth to scabrid.
        3. Basal portion of glumes hard, terete or nearly so, yellowish, flat and green above, broadening somewhat then tapering so that the widest part of glume is not at the base. 3. *E. riparius*
        3. Basal portion of glume flat or channeled or plano-convex in cross-section, not much if at all indurated, the widest part at the very base or little above. 4. *E. canadensis*

1. Elymus virginicus L.

Stems to 12 dm tall, the herbage green or glaucous. Leaf sheaths glabrous or pubescent, the blades striate, to about 12 mm wide, margins finely scabrid, surfaces smooth or minutely pubescent. Spikes variable in length, to about 15 cm long, at maturity exserted from the sheaths, the stalks stiff. Spikelets in pairs; glumes narrowed at the very base, hard, terete or nearly so, yellowish, flat and green above and at least somewhat expanded so that the widest portion is somewhat above the lowermost green portion, thence strongly tapering and usually long-awned (occasionally only long-pointed); lemmas usually awned, the awns 5–25 mm long; glumes and lemmas variously scabrid, sometimes hirsute.

River banks, floodplain woodlands, moist woods, hammocks, adjacent clearings and ditches, meadows, prairies, marshy shores. Nfld. to Alta., generally s. to n. Fla., n. N.Mex. and n. Ariz.

2. Elymus villosus Muhl. ex Willd.

Stems 8–12 dm tall. Leaf sheaths glabrous or usually pilose, the blades 6–10 mm wide, commonly pilose on the upper surfaces, glabrous below, margins finely scabrid. Spikes variable in length, mostly not over 1 dm long, at maturity long-exserted from the sheaths, the stalks thin and flexuous. Spikelets usually paired; basal portion of glumes terete, villous, pale, not much if any narrower than the flat green portion above, the glumes thus setaceous, long-awned, not bowed-out at the base thus forming an acute angle between; lemmas with awns 1.5–3.5 cm long. Joints of spike, glumes and lemmas villous; in some cases merely scabrid.

Usually in rich woodlands, but sometimes in adjacent moist ditches and in floodplain woodlands. Que. to N.Dak. and Wyo., generally s. to cen. and w. N.C., S.C., Ala., Okla., and Tex.

3. **Elymus riparius** Wieg.

Stems to 15 dm tall or little more. Leaf sheaths glabrous or ciliate on the margins, the blades very finely scabrid surficially and marginally, 8–15 mm wide. Spikes 6–15 cm long, often slightly arching, at maturity well exserted from the sheaths, the stalks stiff. Spikelets usually in pairs; basal portion of the glume hard, terete or nearly so, yellowish, not bowed-out thus forming an acute angle between; flat above and green, narrow but the widest portion somewhat above where the flat green part commences, tapering gradually into the awn; lemmas with awns 1.5–3 cm long.

River banks and floodplain woodlands, borders of streams. Maine to Wis., Iowa, Nebr., generally southward to w. N.C. and Ark.

4. **Elymus canadensis** L. Fig. 53

Stems to 15 dm tall. Leaves often glaucous, sheaths glabrous, rarely ciliate, the blades to 15 mm wide, glabrous or scabrid on the upper surface. Spikes usually dense, to 2.5 dm long, sometimes slightly arching. Spikelets commonly 3 at a node; basal portion of glumes flat, channelled or plano-convex in cross-section, little narrowed, not much if at all harder than above, green or pale only at the very base; not bowed-out, thus the angle between acute or nearly so, widest part at or just above the very base then tapering to an awned tip; lemmas with awns 1–4 cm long, the awns sometimes curved; glumes and lemmas usually more or less scabrid.

Dry to moist soil, usually in open places, river banks, thickets, borders of sluggish streams. Nearly throughout the U.S. excepting S.C., Ga., Ala., and Fla.

12. Glyceria (MANNAGRASSES)

Perennial, commonly with bases of stems somewhat decumbent and rooting at the nodes, then ascending or erect. Leaf blades flat or folded, sheaths closed or partially closed. Panicles spreading or narrow. Spikelets 3–many-flowered, flattish to nearly terete. Glumes unequal, short, obtuse or acute, usually hyaline or scarious, mostly 1-nerved, sometimes the second 3-nerved. Lemmas mostly 5–9-nerved, convex on the back, firm but with a scarious margin or apex. Disarticulation is above the glumes and between the florets.

1. Spikelets linear, nearly cylindric, 1 cm long or more.
  2. Lemmas 6–10 mm long, apically acute to long-acute, even acuminate, the palea somewhat longer and extruded from the lemma. 1. *G. acutiflora*
  2. Lemmas 3–4 mm long, apically broad and several-notched; palea shorter and included.
    3. The lemmas faintly nerved, 4 mm long, with minute bristly hairs surficially. 2. *G. septentrionalis*
    3. The lemmas strongly nerved, 3 mm long, surficially with minute thin, softish hairs. 3. *G. arkansana*
1. Spikelets lanceolate, ovate, or oblong, 3–10 mm long.
  4. Panicle either very narrow and elongate, or dense, oblong or elliptic.
    5. Panicle very narrow, 0.3–3.0 cm wide, elongate, to 25 cm long, not dense. 4. *G. melicaria*
    5. Panicle dense, oblong or elliptic, about 10 cm long and 4 cm broad. 5. *G. obtusa*
  4. Panicle loose and open, the branches wide-spreading, flexuous, filiform or capillary.
    6. Glumes both 1-nerved.
      7. Lemmas ovate, apically abruptly short-acuminate, the nerves faint; spikelets about as broad as long, even broader. 6. *G. canadensis*
      7. Lemmas elliptic to obovate, spikelets longer than broad.
        8. First glume less than 1 mm long; lemmas obovate. 7. *G. striata*
        8. First glume about 1.5 to nearly 2 mm long; lemmas elliptic. 8. *G. grandis*
    6. First glume 1-nerved, second glume 3-nerved. 9. *G. pallida*

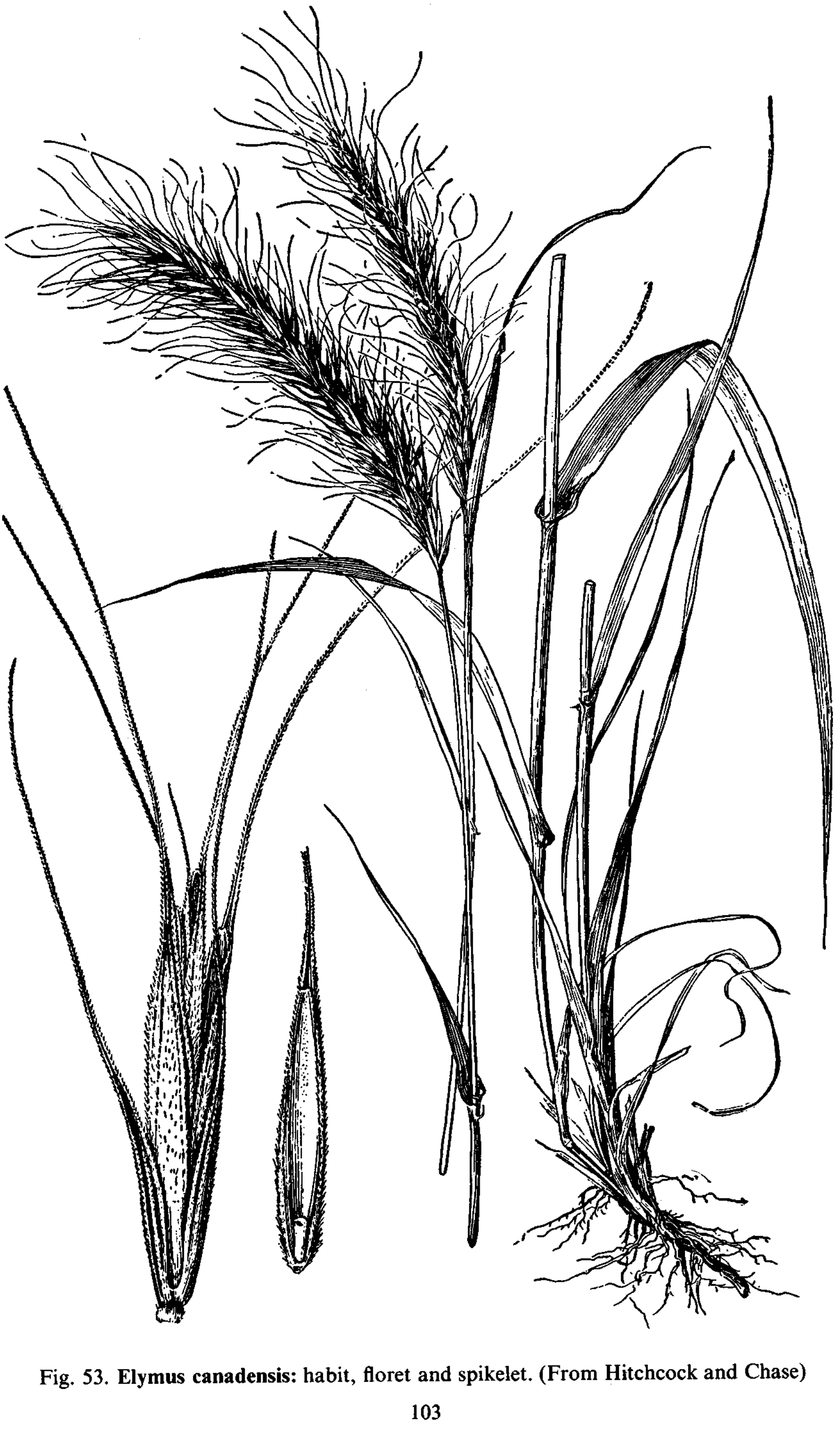


Fig. 53. **Elymus canadensis:** habit, floret and spikelet. (From Hitchcock and Chase)

1. **Glyceria acutiflora** Torr. Fig. 54

Stems slender, weak, usually decumbent basally and rooting at the nodes, 3–10 dm tall, glabrous. Uppermost leaf sheath usually enclosing the base of the panicle, blades flat, 10–15 cm long, 1–7 mm wide, barely scabrous above. Panicle narrow, with few short appressed-ascending branches bearing 1–2 spikelets. Spikelets subcylindric, subsessile or short-stalked, slightly overlapping, 1–2 (–4) cm long, 5–12-flowered; first glume short, about 3 mm long, elliptic, apically obtuse, second longer, about 6 mm, subulate, both thin; lemmas 7-nerved, lanceolate, 6–10 mm long, tapering to an acute or long-acute summit, this often notched or short-lobed, the narrowly linear soft tip of the palea extruding beyond the lemma. (*Panicularia acutiflora* (Torr.) Kuntze)

Wet soil or in shallow water, pond shores and marshes, muddy pools, wet pastures. S. N.H. to Va. and Tenn., w. to Mo., Ill., Mich.

2. **Glyceria septentrionalis** Hitchc. Fig. 55

Stems commonly decumbent below, rooting at the nodes, often colonial, stoutish and soft, 1–1.5 m tall, glabrous. Leaf blades flat, 10–20 dm long and 4–12 mm wide, glabrous. Panicle 2–4 dm long, relatively narrow, the lateral branches relatively distant, slender and ascending, the spikelets few per branch, some distance from each other to barely overlapping, subsessile or short-stalked, linear, nearly cylindric, 1–2 cm long, 6–20-flowered; glumes unequal, thin, apically obtuse, 2–3 and 3–4 mm long; lemmas 4 mm long, faintly nerved, apically broad but notched, surficially with minute bristly hairs, the palea not extruded. (*Panicularia septentrionalis* (Hitchc.) Bickn.)

Wet places, often in shallow water, marshy shores of ponds, sloughs, wet woodlands, ditches. N.E. to Minn. generally southward to Ga. and e. and s.e. Tex.

3. **Glyceria arkansana** Fern.

Similar to the preceding, the stems considerably coarser, harder. Lemmas strongly nerved, 3 mm long, surficially with minute softish hairs, those on the nerves longer than those between.

Shallow water, pond and lake shores, ditches, sloughs, swampy places. La., Ark., Okla.

4. **Glyceria melicaria** (Michx.) Hubb. Fig. 55

Stems solitary or few, slender, soft, 6–10 dm tall, glabrous. Leaf blades elongate, 2–3 (–5) mm wide, surficially finely scabrous. Panicles narrow, 0.3–3 cm broad, rather loose, 10–25 cm long, the lateral branches slender and strongly ascending. Spikelets about 4 mm long, 3–4-flowered; glumes unequal, thin, both more than half as long as the spikelet, acute apically; lemmas relatively faintly nerved, glabrous, elliptic, mostly about 2 mm long, apically acute or nearly so. (*Panicularia melicaria* (Michx.) Hitchc.)

Wet places along woodland streams, bogs, seepage slopes. Que., N.B., N.S., to n. Ohio; s. to mts. of N.C. and e. Tenn.

5. **Glyceria obtusa** (Muhl.) Trin.

Stems somewhat stoutish and hard, often decumbent basally and rooting at the nodes, then stiffly erect, 5–10 dm tall. Leaf blades elongate, mostly 6–10 mm wide, scabrous above. Panicles very dense, in outline oblong or elliptic, 10 (–15) cm long and (1–) 4 cm broad. Spikelet stalks of various lengths from 0.5–3 cm long, crowded, 3–7-flowered, 4–6 mm long; glumes somewhat unequal, stiffish, obtuse apically; lemmas faintly nerved, firm, smooth and somewhat shiny, the margins thickened, 3 mm long or a little more, obtuse apically. (*Panicularia obtusa* (Muhl.) Kuntze)

Springy woodlands, bogs, swales. N.S. to N.C.

6. **Glyceria canadensis** (Michx.) Trin. RATTLESNAKE MANNAGRASS. Fig. 55

Stems solitary or few in a tuft, rooting at the lower nodes, glabrous, 3–10 dm tall. Leaf blades elongate, 3–7 mm wide, scabrous above. Panicle loose, open, roughly pyramidal,

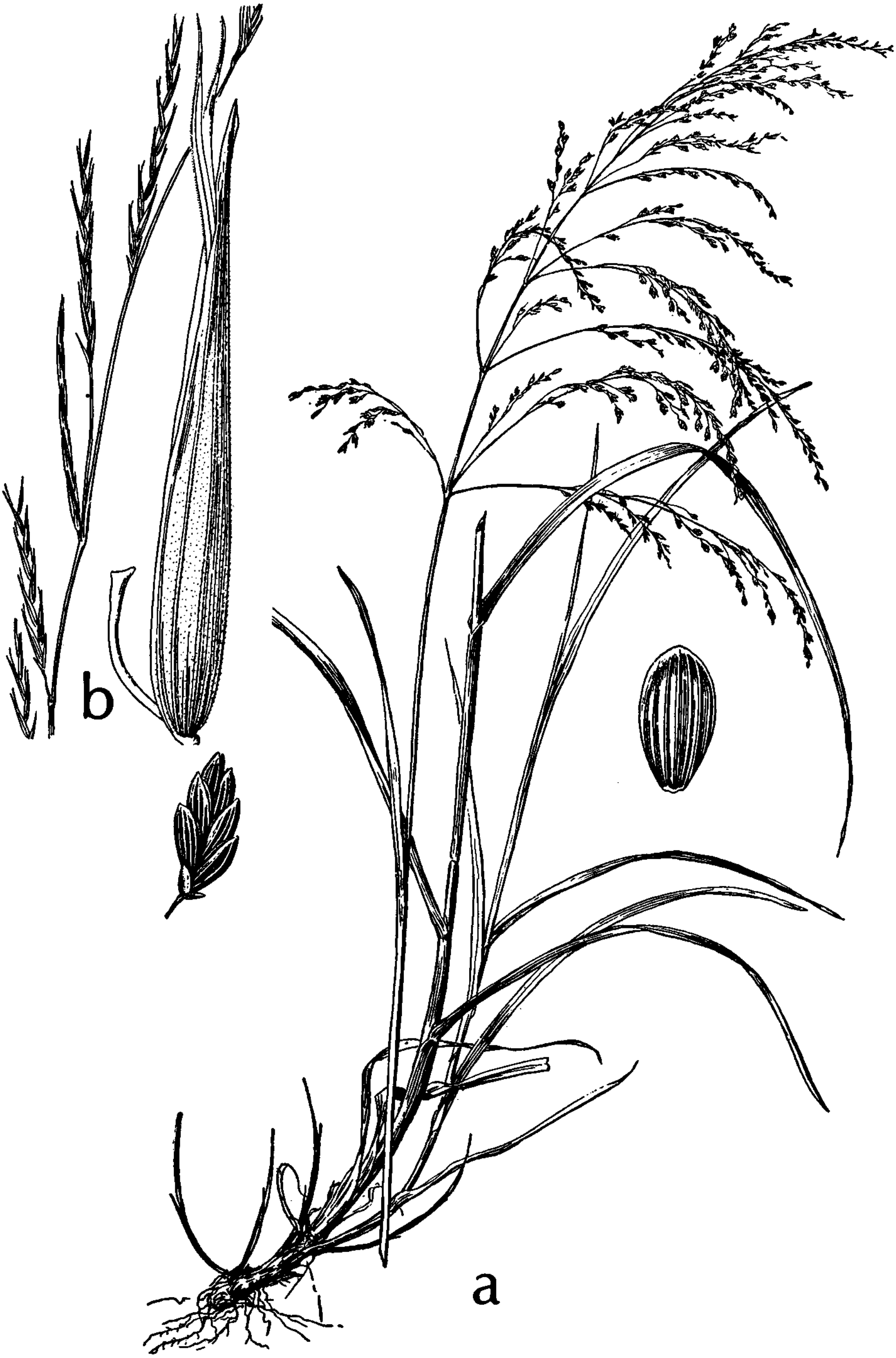


Fig. 54. a, **Glyceria striata:** habit, spikelet and floret; b, **Glyceria acutiflora:** portion of panicle and floret. (From Hitchcock and Chase)

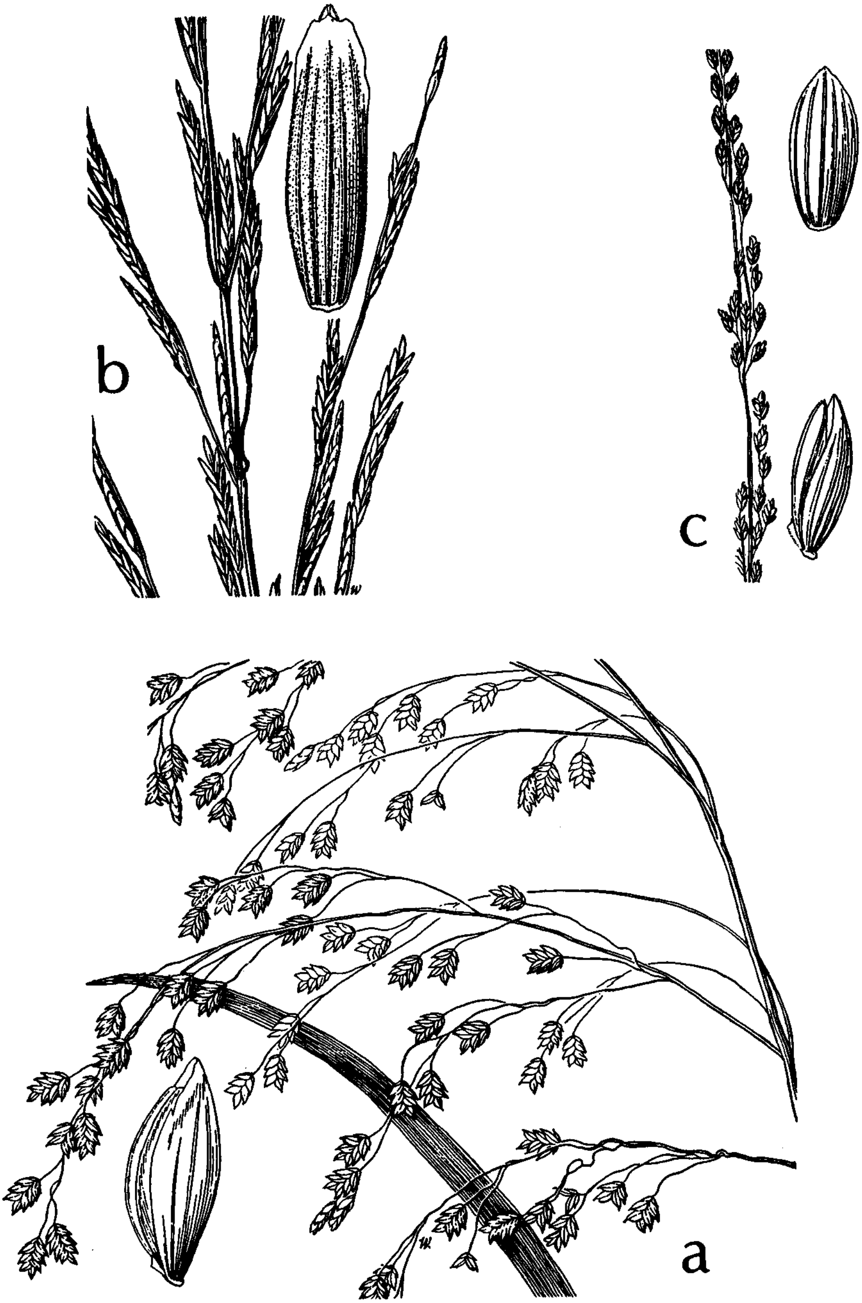


Fig. 55. a, **Glyceria canadensis:** portion of panicle and floret; b, **Glyceria septentrionalis:** portion of panicle and floret; c, **Glyceria melicaria:** portion of panicle and floret (two views). (From Hitchcock and Chase)

the branches wide-spreading, capillary, flexuous, somewhat pendulous. Spikelets on capillary stalks 0.5–1.2 cm long, 2–4 (–7) flowered, mostly about 5 mm long and as broad; glumes unequal, purplish, the first triangular, apically obtuse, second ovate-acuminate, longer than first, both much shorter than the lower lemmas; lemmas ovate, the apices abruptly short-acuminate, faintly nerved, smooth and somewhat shiny; paleas boat-shaped.

Wet places, often in shallow water, meadows, bogs, shores of streams, ponds and lakes, ditches. Nfld. to Minn., s. to w. N.C. and Ill.

7. **Glyceria striata** (Lam.) Hitchc. FOWL MANNAGRASS. Fig. 54

Plants tufted. Stems erect, glabrous, 6–12 dm tall. Leaf blades 2–5 (–8) mm wide, mostly about 1–1.5 dm long, finely scabrous above. Panicles open and diffuse, roughly pyramidal, the branches filiform, naked below. Spikelets 3–4 mm long, a little longer than broad, often purplish, 3–7-flowered; glumes unequal, first oblong, acute, less than 1 mm long, second ovate, obtuse, both shorter than the lower lemmas; lemmas elliptic to obovate, smooth, relatively strongly nerved, apically obtusish. (*Panicularia striata* (Lam.) Hitchc.)

Wet places, sometimes in shallow water, marshy shores of ponds, lakes, streams, wet woodlands, seepage slopes, ditches. Nfld. to B.C., generally southward throughout the U.S. to n. Fla. and n. Calif.

8. **Glyceria grandis** S. Wats. Fig. 56

Similar in aspect to the preceding, the stems usually stouter, the leaves longer and broader, to 12 (–15) mm wide. Spikelets usually purple, linear-oblong, 5–6 mm long, florets loosely overlapping; first glume about 1.5 to nearly 2 mm long; lemmas elliptic, weakly nerved, apices rounded, sometimes minutely notched. (*Panicularia grandis* (S. Wats.) Nash)

Wet places, often in shallow water, stream banks, thickets, bogs, wet meadows, ditches. P.E.I. to Alaska; s. to mts. of Va. and e. Tenn.; W.Va. and Ohio to Nebr., N.Mex., Ariz. and Oreg.

9. **Glyceria pallida** (Torr.) Trin. Fig. 56

Stems slender and weak, decumbent below and rooting at the nodes, often in water, sometimes floating. Leaf blades 1–5 (–8) mm wide, to 1 (–2) dm long, finely scabrous above. Panicle open, with relatively few branches, overall 5–15 cm long, the branches filiform-flexuous. Spikelets 4–5 mm long, mostly 3–6-flowered. Glumes unequal, second faintly 3-nerved, first sometimes 3-nerved basally; lemmas narrowly ovate, rather strongly nerved, apically obtuse, usually shallow-notched or erose, sometimes some of them acute. (*Panicularia pallida* (Torr.) Kuntze)

Bogs, marshy shores of ponds, lakes, streams, swamps, pools and sloughs. N.S. and Maine to Minn., s. to N.C., Tenn., Ky. and s.e. Mo.

13. Digitaria (CRABGRASSES)

Digitaria serotina (Walt.) Michx.

Annual or perennial in the southern parts of the range. Stems usually creeping and rooting at the nodes, often forming extensive mats, the flowering stems branching and arching-erect, 1–3 dm tall. Principal leaf blades short, flat, mostly about 5 cm long and 5–8 mm wide, acute; blades and sheaths copiously pubescent with longish spreading hairs, the bases of the hairs somewhat enlarged; margins of the blades narrowly cartilaginous and finely scabrid. Ligule a thin membranous scale about 1.3 mm high. Inflorescence terminal, of 3–5 slender spikelike racemes, each to 6–7 cm long; raceme axes 2-winged, their margins finely toothed. Spikelets pale, elliptic or oval, about 1.5 mm long, acute or very short acuminate; first glume absent; second glume minute, thin and almost transparent, pubescent, almost as broad as long, its summit truncate; sterile

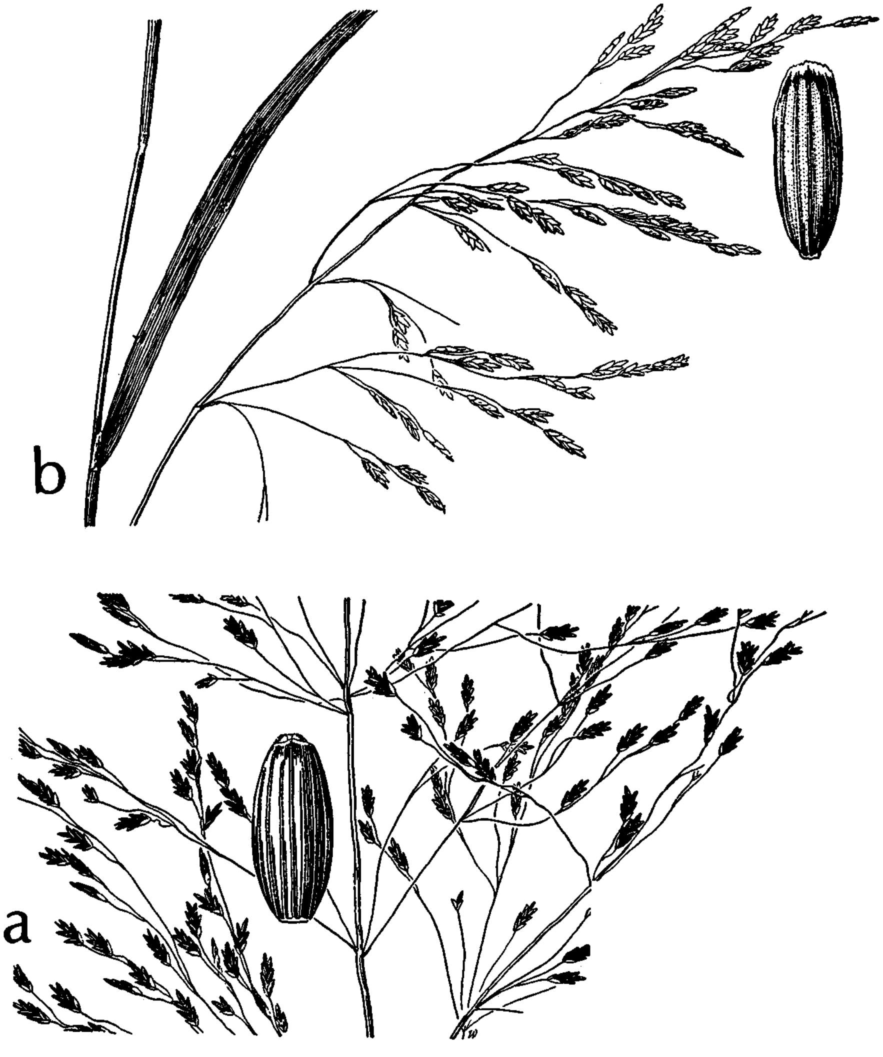


Fig. 56. a, **Glyceria grandis:** portion of panicle and floret; b, **Glyceria pallida:** portions of plant and floret. (From Hitchcock and Chase)

lemma (on the side of the spikelet away from the axis) oval, 7-nerved, not quite as long as the fertile lemma, the tip obtuse, glabrous or sometimes pubescent along the margins; fertile lemma as long as the spikelet, short-acuminate. Disarticulation is below the spikelet.

Moist to wet sandy lake and pond shores, very often in sandy to peaty dry to nearly dry lake and pond bottoms, in moist pastures and clearings. S.e. Va. to s. Fla., w. to La.; Cuba.

Several other crabgrasses occur in our range but as a rule inhabit well-drained sites. One or two species are introductions from the Old World, colonize cultivated and disturbed grounds in great abundance, but are not really wetland plants.

14. Anthaenantia

Anthaenantia rufa (Ell.) Schultes.

Perennial, with short rhizomes from which arise 1–several erect stems, mostly 8–10 dm tall. Stems and leaves striate. Principal leaf blades elongate and narrow, finely scaberulous below and on the margins, to 5–6 mm wide, ascending, the lower most often much shorter, the tips of the blades blunt. Leaf sheaths passing indistinguishably into the blades. Ligule a collar of numerous very short stiff hairs about 0.1 mm long. Stems, leaves and especially the spikelets frequently suffused with a reddish-purple color. Inflorescence a narrow loose terminal panicle with fine ascending branches, the peduncle much exceeding the leaves. Spikelets mostly 3 mm long, long-stalked, oval or elliptic, obovoid when fully mature and the scales have spread at the tip, conspicuously clothed with long soft spreading hairs. First glume absent. Second glume and first lemma similar and about equal, as long as the spikelet, purplish, prominently 5-ribbed, the ribs bearing the long spreading hairs. The first lemma with a thin-membranous palea opposite, this sometimes subtending a staminate floret. Spikelet with a single bisexual terminal floret, the lemma and palea both convex on the back, dark brown but with thin-membranous whitish margins, the edges of the lemma overlapping those of the palea but neither inrolled, loosely enveloping the grain.

In pine flatwoods, peaty margins of ponds, pools or depressions, boggy seepage areas, and wet peaty ditches in flatwoods. Coastal plain, eastern N.C. to n. Fla., w. to e. Tex.

Another species, *A. villosa* (Michx.) Beauv., occurs in our range but on well-drained sites.

15. Brachiaria

Annual (ours), commonly with lower stems decumbent, rooting at the nodes, the upper stems ascending and branching; often matted. Leaf blades flat (inrolled in drying), usually not exceeding 15 cm long and about 1 cm broad, with bony-white or purplish scabrous-cartilaginous margins. Ligule a collar of numerous, short stiff hairs. Inflorescences with a single primary axis bearing alternately spikes or spikelike racemes. Spikelet bearing axis 3-sided, one side flattish or rounded and naked, opposite it a central wing separating the two sides bearing spikelets or spikelet groups alternately. Spikelets very short stalked, ovate, the tips blunt to acute, appressed to the rachis; first glume short-ovate, borne toward the rachis, second glume and first lemma about equal, as long as the spikelet; first lemma opposite a membranous palea, these empty or enclosing a staminate floret; a single bisexual floret above, its lemma and palea hard-cartilaginous.

1. Spikelets more or less suffused with purple pigment, borne in pairs (or threes) in each row. 1. *B. purpurascens*
1. Spikelets green, borne singly in each row.
  2. Upper half of second glume and first lemma with evident transverse veins connecting the longitudinal veins. 2. *B. platyphylla*

2. Upper half of second glume and first lemma without cross-veins, or if these present, very obscure. 3. *B. plantaginea*

1. Brachiaria purpurascens (Raddi) Henr. PARA GRASS. Fig. 57

Plant with stout, elongate creeping stolons from which flowering branches arise, or with branches decumbent below and rooting at the nodes; stems to 1 m tall. Nodes swollen, densely pubescent with short and long hairs close to the nodes; sheaths with scattered pustular-based long hairs, in age the hairs deciduous leaving the pustular bases. Inflorescences mostly long-exserted, with few to about 15 closely set secondary spikelet-bearing branches, each branch 2–5 cm long. Spikelets 3 mm long, more or less suffused with purple pigment, 2–3 on short, pilose stalks, elliptic, apices acute. (*Panicum purpurascens* Raddi; *P. barbinode* Trin.)

Native to Africa. Introduced in our range as a forage grass and to some extent naturalized in cultivated and disturbed places, often where wet. Fla. to Tex.

2. Brachiaria platyphylla (Griseb.) Nash ex Small. BROADLEAF SIGNAL GRASS. Fig. 58

Plants with lower portions of branches decumbent and rooting at the nodes, often forming mats, the flowering branches ascending. Stems slightly narrowed just above the nodes, glabrous. Sheaths with pustular-based long hairs, these sometimes deciduous in age leaving the pustular bases. Inflorescences with up to 5 or 6 distantly spaced secondary spikelet-bearing branches, each 3–6 cm long. Spikelets 4–4.5 mm long, green, narrowly ovate, borne singly in 2 rows, their short stalks pilose; second glume and first lemma extending beyond the "fruit" making the spikelet tip flattish, both with evident cross-veins between the longitudinal ones on the upper half. (*B. extensa* Chase)

Sporadic in open moist to wet, usually cultivated or disturbed sandy places. E. N.C. to Fla., w. to Tex.; northward to Ark., Okla. and s.e. Mo.

3. Brachiaria plantaginea (Link) Hitchc. ALEXANDER GRASS. Fig. 58

Similar to the preceding and (to us) doubtfully specifically distinct. Second glume and first lemma barely exceeding the "fruit," the spikelet thus more turgid apically; upper half of both with no cross veins or these if present obscure.

Sporadic in open moist ground. N. Fla., Miss.; native, Mex. to Bolivia and Brazil.

Other species of *Brachiaria* have been introduced into cultivation, at least on a trial basis, in the southeastern United States and appear to be much less sporadically adventive than those treated above.

16. Axonopus (CARPET GRASSES)

Tufted or stoloniferous perennials. Leaf sheaths compressed, the blades flat or folded, relatively short, the tips blunt or little tapered; ligule a short collar bearing numerous short very stiff hairs. Flowering branches short at anthesis then greatly elongating, becoming lax, filiform, much exceeding the basal or lower stem leaves; bearing a pair of ascending-divergent spikes at the summit, sometimes with another 1–2 (–3) borne subterminally. Spikelets sessile, alternating in two ranks on two sides of a triangular rachis (infrequently in three ranks on the three sides), appressed to the rachis; a single glume present, borne next to the axis, equalling the sterile lemma which is away from the rachis, these enclosing a single floret.

- Spikelets 4–5 (–6) mm long, glabrous; sterile lemma with a midvein. 1. *A. furcatus*
- Spikelets 2 (–2.2) mm long, usually with some silky hairs; sterile lemma without a midvein. 2. *A. affinis*

1. Axonopus furcatus (Flügge) Hitchc. Fig. 59

Tufted or extensively creeping. Flowering stems to 10 dm tall. Larger leaf blades 5–15 cm long (or somewhat longer), mostly 5–10 mm wide, their tips blunt or relatively short-tapering, occasionally pubescent. Spikelets 4–5 (–6) mm long, glabrous, the sterile lemma with a midvein.

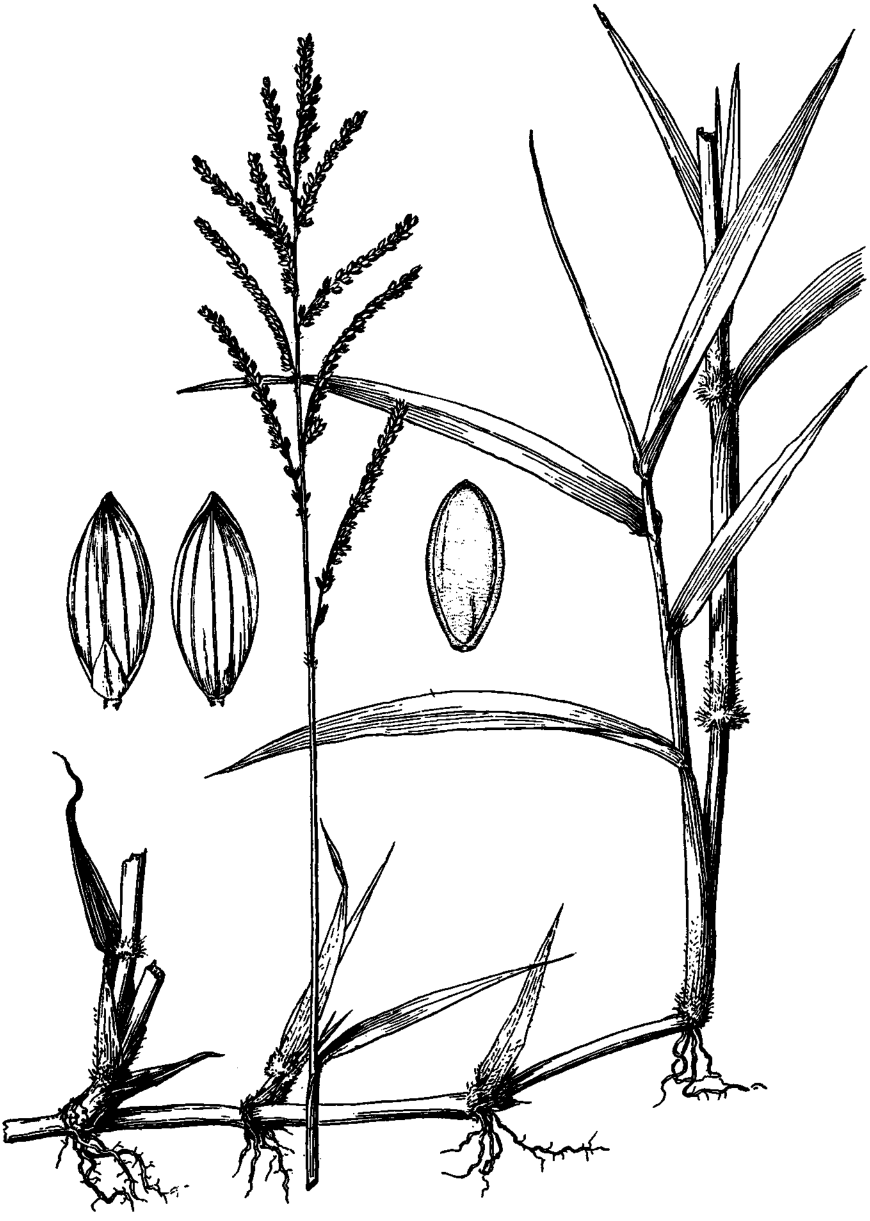


Fig. 57. **Brachiaria purpurascens:** habit, spikelet (two views), and floret. (From Hitchcock and Chase)

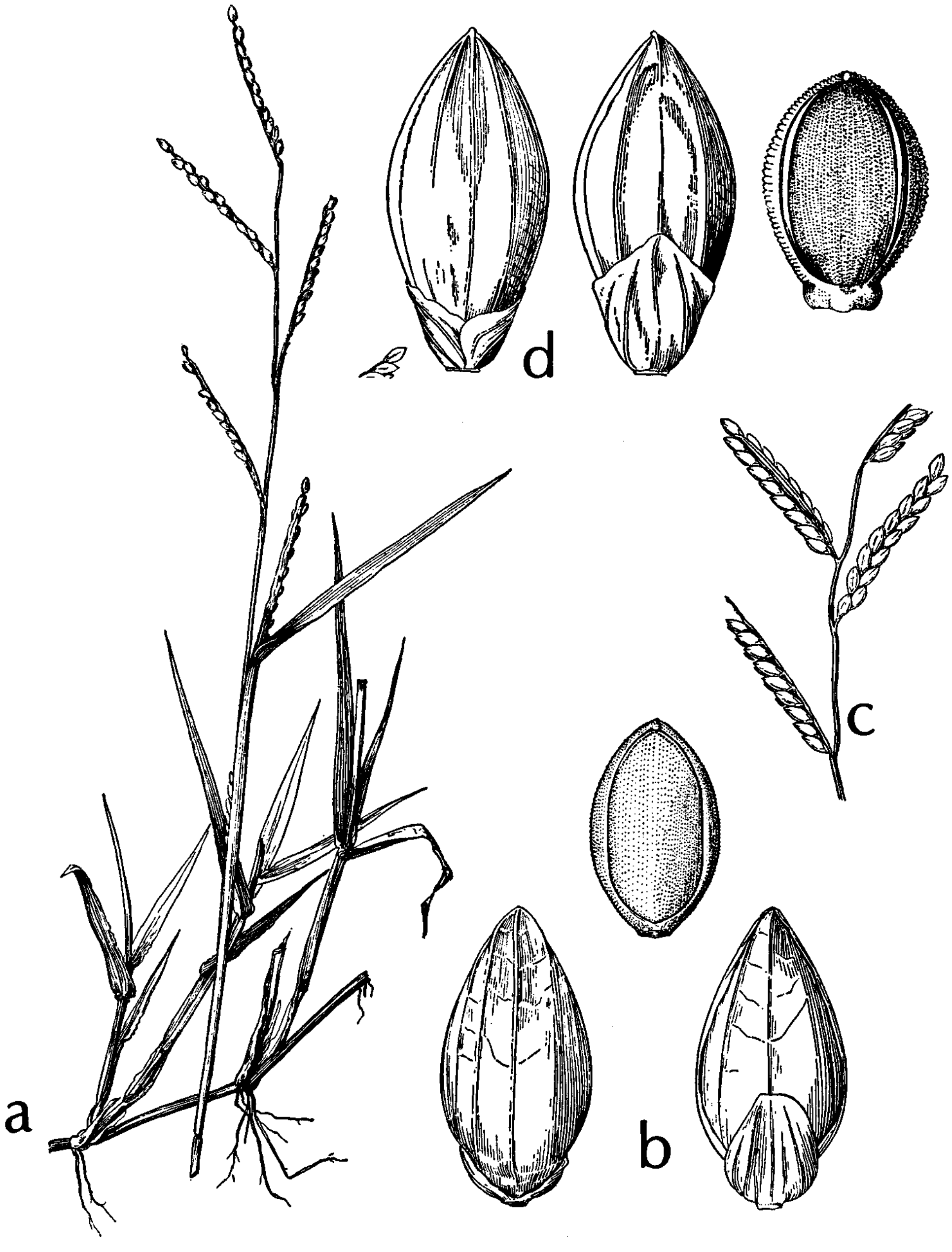


Fig. 58. a–b, **Brachiaria platyphylla:** a, habit; b, spikelet (two views) and floret; c–d, **Brachiaria plantaginea:** c, panicle; d, spikelet (two views) and floret. (From Hitchcock and Chase)

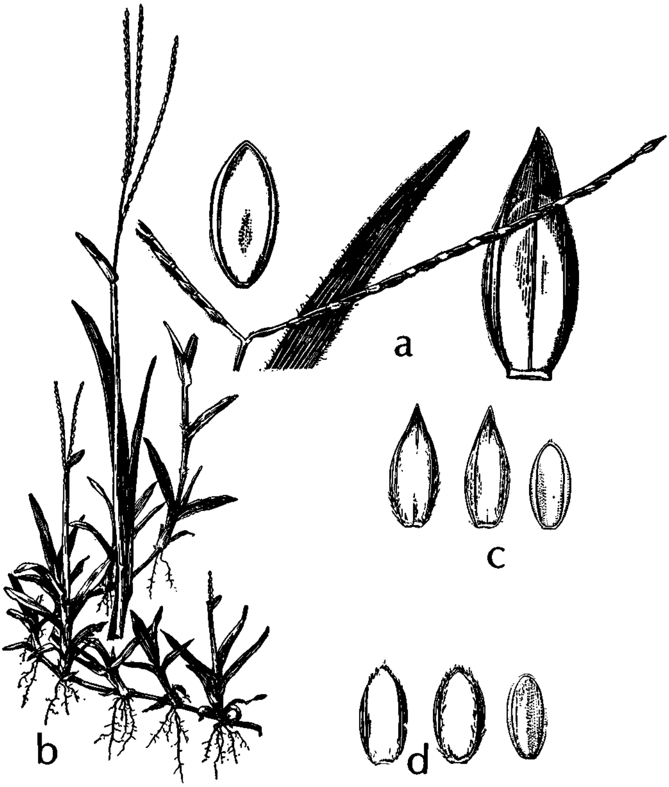


Fig. 59. a, **Axonopus furcatus:** portion of leaf and inflorescence, spikelet and floret; b–c, **Axonopus compressus:** b, habit; c, spikelet (two views) and floret; d, **Axonopus affinis:** spikelet (two views) and floret. (From Hitchcock and Chase)

Wet soils, floodplain forests, shores of ponds and streams, swampy woodlands, ditches, pineland depressions. S.e. Va. to s. Fla., w. to e. and s.e. Tex., Ark.

2. Axonopus affinis Chase. Fig. 59

Vegetatively very similar to the preceding, on the average a bit less robust. Spikelets 2 (-2.2) mm long, often clothed unevenly with silky hairs, the sterile lemma without a midvein.

Wet soils, marshy shores of ponds and streams, swampy woodlands, wet clearings. N.C. to s. Fla., w. to e. and s.e. Tex., Ark., Okla.; Cuba, s. Mex. to S.Am.

Extensively used as a pasture grass.

A. compressus (Sw.) Beauv. is apparently of very sporadic occurrence in our range. Its spikelets are of intermediate length relative to the two species treated here, being 2–3 mm long (Fig. 59).

17. Reimarochloa

Reimarochloa oligostachya (Munro) Hitchc. Fig. 60

Perennial with lower branches creeping and rooting at the nodes, sometimes mat-forming, the flowering branches ascending from 2–4 dm. Sheaths somewhat overlapping, pilose at the summit; blades flat or folded, relatively short, to about 10 cm long and 2–4 mm wide, minutely pubescent at least when young; ligule a collarlike scale. Inflorescence at anthesis partially exserted from the sheath, later short-exserted, a terminal pair of divergent spikes, or with 1 or 2 below on a short axis, the spikes to 5–8 cm long. Spikelets sessile or subsessile, in two rows on one side of a winged rachis; plano-convex, glabrous, lanceolate, their apices acuminate, lacking glumes (the terminal spikelet of the spike sometimes with one glume); sterile and fertile lemmas about equal, the latter borne next to the rachis and inrolled over the palea only at the base.

Alluvial river shores, mucky shores of ponds or streams, sometimes in water, moist to wet pastures and cultivated grounds. Fla.; Cuba.

18. Eriochloa (CUPGRASSES)

Annual or perennial, tufted. Leaves flat, striate. Ligule a ring or fringe of numerous hairs. Spikelets short-stalked, the stalks terminated by a ringlike callus, adnate to which is the small cuplike first glume (the latter often falling early hence not always evident) giving the name cupgrass. Disarticulation is below the callus. Inflorescence a terminal panicle. Spikelets 1-flowered or sometimes with a staminate flower below the fertile; second glume and sterile lemma about equal, longer than the floret thus giving the length of the spikelet. Fertile lemma hard and tough, apically with a stiff hard mucro or short awn, inrolled, enclosing the similarly inrolled palea.

1. Panicle open, with a single central axis from which diverge at rather remote intervals 3–20 narrow racemelike lateral panicles, the lower commonly about 10 cm long, gradually diminishing in length upward. 1. *E. michauxii*
1. Panicle narrow overall, the secondary racemelike branches short, appressed-ascending, of uneven lengths.
    2. Stalks of spikelets and axes of panicles scabrous; spikelets tapered to an acute or slightly acuminate apex; leaf blades essentially glabrous. 2. *E. punctata*
    2. Stalks of spikelets and axes of panicle scabrous and with numerous long hairs as well; spikelets long-acuminate; leaf blades short-pubescent. 3. *E. contracta*

1. Eriochloa michauxii (Poir.) Hitchc. Fig. 61

Perennial, usually only slightly tufted. Stems erect, unbranched, 6–12 dm tall, lower internodes glabrous, upper short-pubescent; nodes (some of them at least) velvety-pubescent, leaf blades flat, glabrous, variable in length, to 1.5 cm wide, usually not exceeding 1 cm; sheaths glabrous or sometimes with a few pustular-based hairs toward

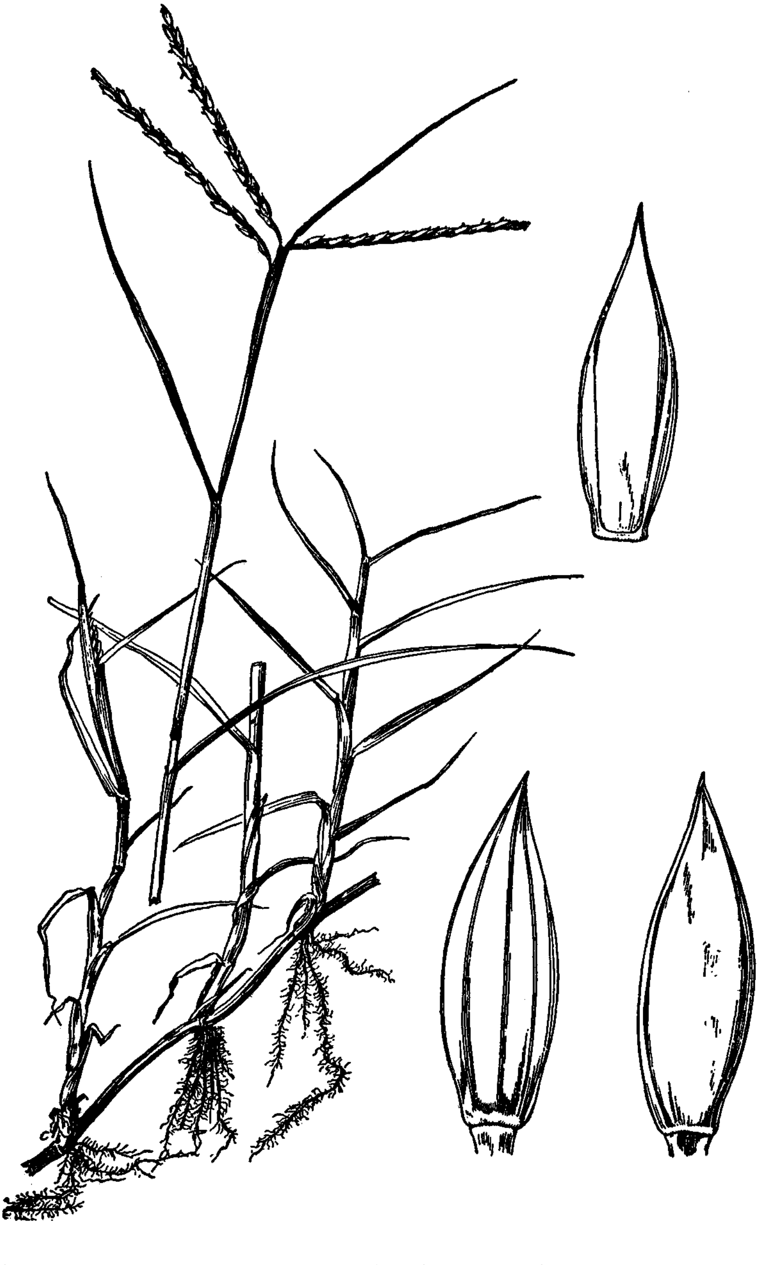


Fig. 60. **Reimarochloa oligostachya:** habit, spikelet (two views) and floret. (From Hitchcock and Chase)

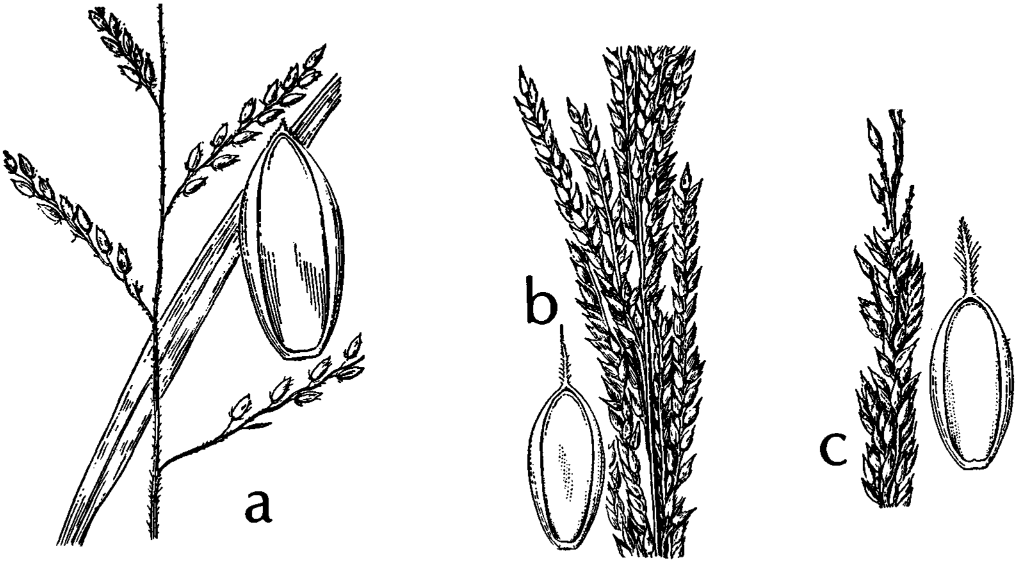


Fig. 61. a, **Eriochloa michauxii:** panicle and floret; b, **Eriochloa punctata:** portion of panicle, floret; c, **Eriochloa contracta:** portion of panicle, floret. (From Hitchcock and Chase)

their summits. Panicle open, with a single central axis from which diverge at rather remote intervals several to about twenty narrow racemelike lateral panicles, the lower about 10 cm long, gradually diminishing in length upward. Spikelet stalks and axes of panicle usually densely soft pubescent; sometimes only with scattered pustular-based hairs. Spikelets lanceolate, 4–5 mm long, acute or short-acuminate, copiously pubescent with silky appressed to loosely ascending hairs; fertile lemma with a pubescent, stiff, short awnlike apiculation.

River banks, prairies, brackish or fresh marshes, wet pinelands. Coastal plain, Ga. and Fla.

2. **Eriochloa punctata** (L.) Desv. Fig. 61

Perennial (flowering first year). Stems tufted, the lower stems often bent at the nodes, decumbent, freely branching, the flowering branches ascending to 1 m; nodes pubescent. Leaf sheaths and blades glabrous, the blades flat or folded, to about 10 mm wide. Panicle narrow, with numerous overlapping racemelike branches; spikelet stalks and axes of panicle scabrous. Spikelets lanceolate, 4–6 mm long, their apices acute or short-acuminate, sparsely appressed pubescent; fertile lemma with a stiff scabrous awnlike mucro 1 mm long or a little longer.

Moist soil near ponds, seasonally wet areas, marshes, river banks. S. Tex. to La.; trop. Am.

3. **Eriochloa contracta** Hitchc. Fig. 61

Annual, tufted. Stems erect or decumbent below, freely branching, to 8 dm tall; nodes and internodes short-pubescent (rarely glabrous). Leaf blades flat or folded, 2–6 mm wide, both blades and sheaths short-pubescent (rarely glabrous). Panicle narrow, the racemelike branches short, appressed-ascending; stalks of spikelets and axes of panicle scabrous and with long hairs. Spikelets lanceolate, acuminate to an awnlike point, shaggy-pubescent; fertile lemma with a stiff scabrous apiculation or awnlike tip 0.3–0.8 mm long.

Open seasonally wet ground, cultivated fields, drainage and irrigation ditches, lawns, roadsides. La. to Ariz., n. to Colo., Nebr. Sporadically adventive elsewhere.

19. Paspalum

Mostly perennial. Ligule a scale, in some with a brush of hairs behind it. Spikelets flat on one side, convex on the other (i.e., plano-convex), stalked, solitary and alternating on either side of the inflorescence axis, thus in two rows on the axis, or in pairs on forked stalks, thus in four rows. Racemes borne singly terminally, in pairs terminally, or alternating racemosely on the upper portion of the single primary axis; in some species racemes from leaf axils as well. Spikelets 1-flowered, in most species the first glume lacking; (if first glume present on the flat side of the spikelet then very small relative to the second glume and sterile lemma which are about equal). Convex side of the spikelet (sterile lemma side) toward the axis though sometimes spikelet stalks twisting and altering that position. Fertile lemma hard, its margins inrolled over a hard palea, these enclosing the grain, the whole commonly referred to as the "fruit." Disarticulation is below the spikelet.

1. Raceme axis broadly winged, nearly as wide as to wider than the rows of spikelets and more or less folded over them.
  2. Inflorescence comprised of (1–) 2–4 racemes; winged portion of the rachis slightly shorter than the spikelet-bearing portion; spikelets glabrous.
    3. Stems spongy; spikelets 3.0–3.5 mm long, abruptly pointed at their apices; blades of principal leaves 5–12 mm wide. 1. *P. acuminatum*
    3. Stems wiry; spikelets 2 mm long or a little less, obtuse at their apices; blades of principal leaves 2–5 mm wide. 2. *P. dissectum*
  2. Inflorescence comprised of 20–50 or more racemes, rarely fewer; winged portion of the rachis extending as a point beyond the spikelet-bearing portion; spikelets pubescent. 3. *P. repens*

1. Spikelet axis narrower than the width of the rows of spikelets and not folded over them.
  4. Spikelets bearing long silky pubescence, principally along their margins.
    5. Inflorescences comprised of a single pair of racemes terminating the axis; spikelets solitary, thus 2 rows on the raceme. 4. *P. conjugatum*
    5. Inflorescence comprised of 3–many racemes; spikelets paired (by forking of the stalks), thus 4 rows on the raceme.
      6. Racemes 3–6, rarely to 10, per inflorescence, widely spreading or loosely ascending; spikelets mostly 3–3.5 mm long. 5. *P. dilatatum*
      6. Racemes (8–) 12–20 or more per inflorescence, closely ascending and overlapping; spikelets 2–3 mm long. 6. *P. urvillei*
  4. Spikelets glabrous or if pubescent the hairs not long-silky.
    7. Inflorescence comprised of a single terminal, usually elongate raceme (no racemes from the lower leaf axils). 7. *P. monostachyum*
    7. Inflorescence comprised of two or more racemes.
      8. Racemes 2, arising at the same point terminally, or nearly so.
        9. Plant with extensively creeping stems, rooting at the nodes; spikelets ascending parallel with the rachis and appressed to it, their apices pointed, acute to short-acuminate. 8. *P. distichum*
        9. Plant with thick rhizomes coarsely scaly with old leaf bases; spikelets angling away from the rachis, their apices blunt. 9. *P. notatum*
      8. Racemes 2 or more (one on an occasional plant), usually 3 or more, not arising at the same point terminally.
        10. Spikelets all solitary, thus in 2 rows on the raceme. 10. *P. laeve*
        10. Spikelets or some of them in each raceme paired (by forking of the stalks), solitary if one spikelet aborts.
          11. Mature "fruit," i.e., with glume and sterile lemma removed, shining brown.
            12. Spikelet 2 mm long, as broad as long or nearly so, in outline suborbicular; plant annual. 11. *P. boscianum*
            12. Spikelet 2.5–3.0 mm long, longer than broad, in outline elliptical; plant perennial.
              13. Plant terrestrial, in small tufts, stems slender, erect. 12. *P. plicatulum*
              13. Plant aquatic, with lush submersed parts, "brushes" of roots at the nodes. 13. *P. hydrophilum*
          11. Mature "fruit" pale, not brown and lustrous.
            14. Racemes borne terminally and from the leaf axils, the latter often only partially or not at all exserted from the sheaths. 14. *P. setaceum*
            14. Racemes all borne terminally on the primary axis.
              15. Spikelets 1 mm long or very slightly longer. 15. *P. caespitosum*
              15. Spikelets 2.0 mm long or more.
                16. The spikelets bearing (on glume and sterile lemmas) very conspicuous broad fimbriate wings. 16. *P. fimbriatum*
                16. The spikelets not winged.
                  17. Stems decumbent below and rooting at the nodes. 17. *P. pubiflorum*
                  17. Stems erect.
                    18. Convex side of the spikelet with 3–7 green nerves, at least one pair of the lateral nerves more or less midway between the midnerve and the margin. 18. *P. bifidum*
                    18. Convex side of the spikelet with a midnerve only, or if with two lateral nerves these then near the margin.
                      19. Spikelets glaucous (after full maturity the glaucousness sometimes becoming brownish or peeling off). 19. *P. floridanum*
                      19. Spikelets not glaucous.
                        20. Plant with thick rhizomes, these coarsely scaly with old leaf bases. 9. *P. notatum*
                        20. Plant not rhizomatous or with short slender rhizomes, tufted.
                          21. Spikelets suborbicular, obovate or orbicular, as broad as long or nearly so, their apices broadly rounded, with very little if any taper. 20. *P. praecox*
                          21. Spikelets elliptical, their apices tapered-obtuse. 21. *P. lividum*

1. Paspalum acuminatum Raddi. Fig. 62

Aquatic or subaquatic. Lower stems spongy, creeping or decumbent and rooting at the

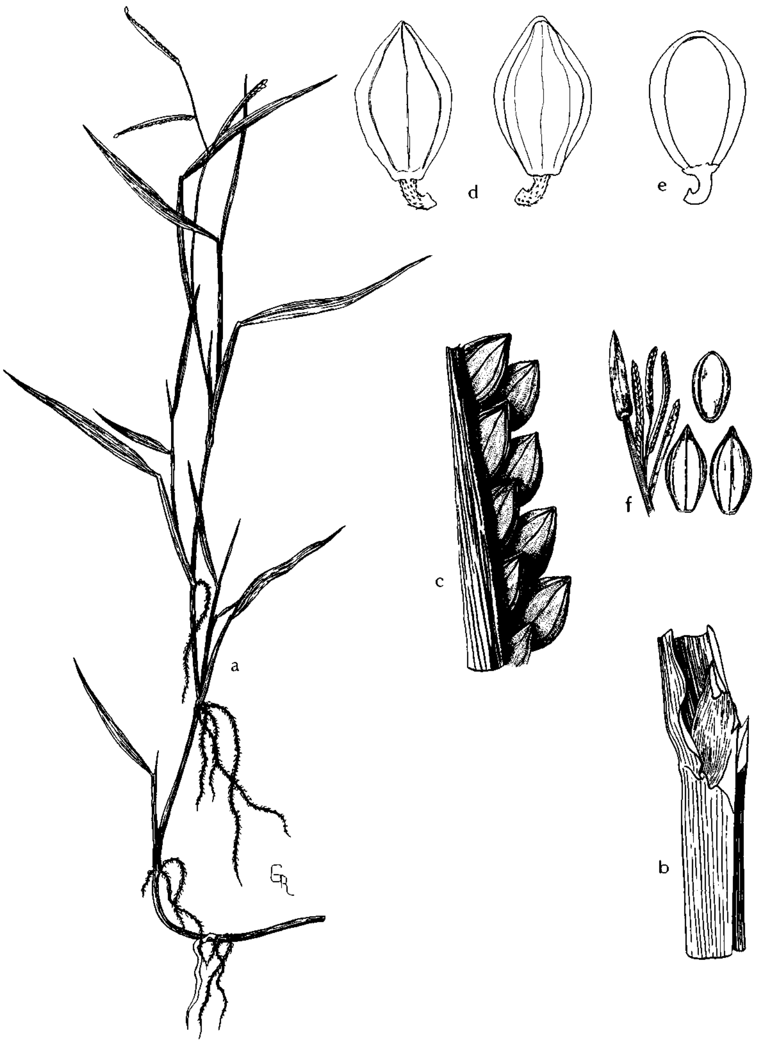


Fig. 62. a–e, **Paspalum dissectum:** a, habit; b, ligule; c, portion of raceme; d, spikelet (two views); e, floret; f, **Paspalum acuminatum:** inflorescence, spikelet (two views) and floret. (f, from Hitchcock and Chase)

nodes, the flowering branches ascending. Principal leaf blades linear to linear-sublanceolate, to 12 cm long and 5–12 mm wide, the margins scabrous-ciliate. Inflorescence with 2 or 3 (–6) spikelet-bearing ascending racemes 3–7 cm long. Rachis winged, 3–3.5 mm broad, essentially as wide as the two rows of spikelets, the winged portion of the rachis somewhat exceeded at the tip of the raceme by the spikelet-bearing portion. Spikelets solitary, glabrous, elliptic, 3.0–3.5 mm long, their apices abruptly pointed.

In shallow water or wet open places. S. La., s. Tex.; trop. Am.

2. **Paspalum dissectum** (L.) L. Fig. 62

Perennial, commonly with reddish-purple pigment more or less throughout. Lower stems long-creeping and mat-forming, the flowering stems ascending, 2–6 dm tall. Stems slender and coarsely wiry, glabrous. Sheaths loose; leaf blades linear, to 6 cm long and 2–5 mm wide, flat or folded, the margins very very finely scabrous to nearly smooth. Inflorescences both terminal and axillary, each with 1–4 racemes to 3 cm long. Rachis winged, the wings as wide as or wider than the two rows of spikelets (though not appearing so when folded), at the tip of the raceme the winged portion exceeded by the spikelet bearing axis. Spikelets solitary, glabrous, green or straw-colored at maturity, 2 mm long, broadly elliptic, their apices obtuse or subacute. "Fruit" (with glume and sterile lemma removed) pale green or straw-colored.

Colonial in shallow water, marshy shores, wet open places; not infrequently in abundance in muds or peats of ponds after water levels recede during drought periods. S. N.J. to cen. Fla., w. to e. Tex.; in the interior n. to Tenn., s. Ill. and Mo.

3. **Paspalum repens** Berg. Fig. 63

Annual, aquatic or subaquatic, with sprawling, often elongate, spongy stems; if in water mostly submersed, only the inflorescences emersed, the nodes bearing "brushes" of copious dark roots; in wet soils decumbent and rooting at the nodes. Sheaths loose, often inflated-spongy, soft-pubescent with pustular-based hairs, often purple-spotted; blades lanceolate, to 2.5 dm long and 2.5 cm broad, both surfaces finely striate, scabrous along the striations. Inflorescences with 20–50 or more secondary spikelet bearing branches (rarely fewer). Rachis winged, as broad as the two rows of spikelets (though not appearing so when wings folded), the tips of the rachis extending somewhat beyond the spikelet-bearing axis. Spikelets solitary, pubescent, elliptical, mostly about 1.7 mm long, the apices acute; glume and sterile lemma membranous. (*P. fluitans* (Ell.) Kunth)

Floating in sluggish or quiet waters of streams, in standing water of swamps or in alluvium of swamps, in mud and water near shores of ponds and lakes, stream banks. S.e. Va. to Fla., w. to s.e. Tex.; in the interior to Ky., Ind., Ill., Mo. and e. Okla; trop. Am.

4. **Paspalum conjugatum** Berg. SOUR-GRASS. Fig. 64

Plant with branches decumbent and rooting at the nodes, more commonly with long leafy runners, mat-forming, the flowering branches ascending to 2–5 (–10) dm. Stems glabrous though the nodes of the runners bearded (at first at least). Sheaths sometimes pilose near the summit and variously pubescent at the junction with the blade; blades of the runners linear-oblong, short-tapered, to about 5 cm long, those of the flowering stems usually longer, 8–12 cm long and 5–15 mm wide, finely scabrous on the margins, sometimes irregularly ciliate on or near the margins as well. Inflorescence a terminal pair of divergent narrow racemes 3–12 cm long or more (rarely a third below). Spikelets about 1.8 mm long, pale yellow or straw-colored, broadly elliptic or ovate, their apices short-tapered, margins fringed with soft silky hairs.

Pantropical, weedy in moist cultivated and disturbed places, ditch banks, sometimes in floodplain forest, Fla. to s.e. Tex.

5. **Paspalum dilatatum** Poir. DALLIS GRASS. Fig. 65

Perennial with short thickish rhizomes and clump-forming. Stems glabrous, leafy at

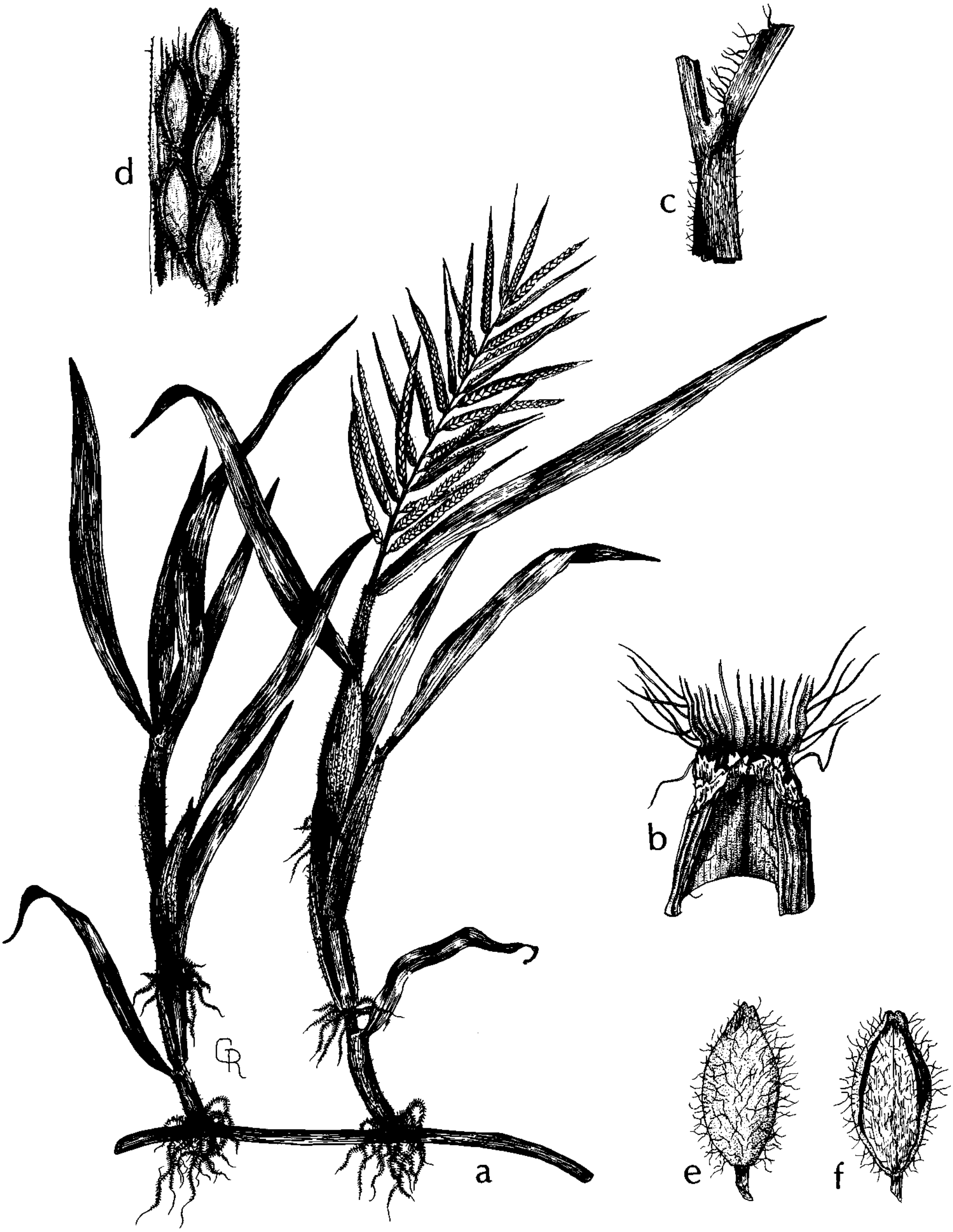


Fig. 63. **Paspalum repens:** a, habit; b, ligule; c, side view at junction of sheath and blade; d, portion of raceme; e–f, spikelet (two views).

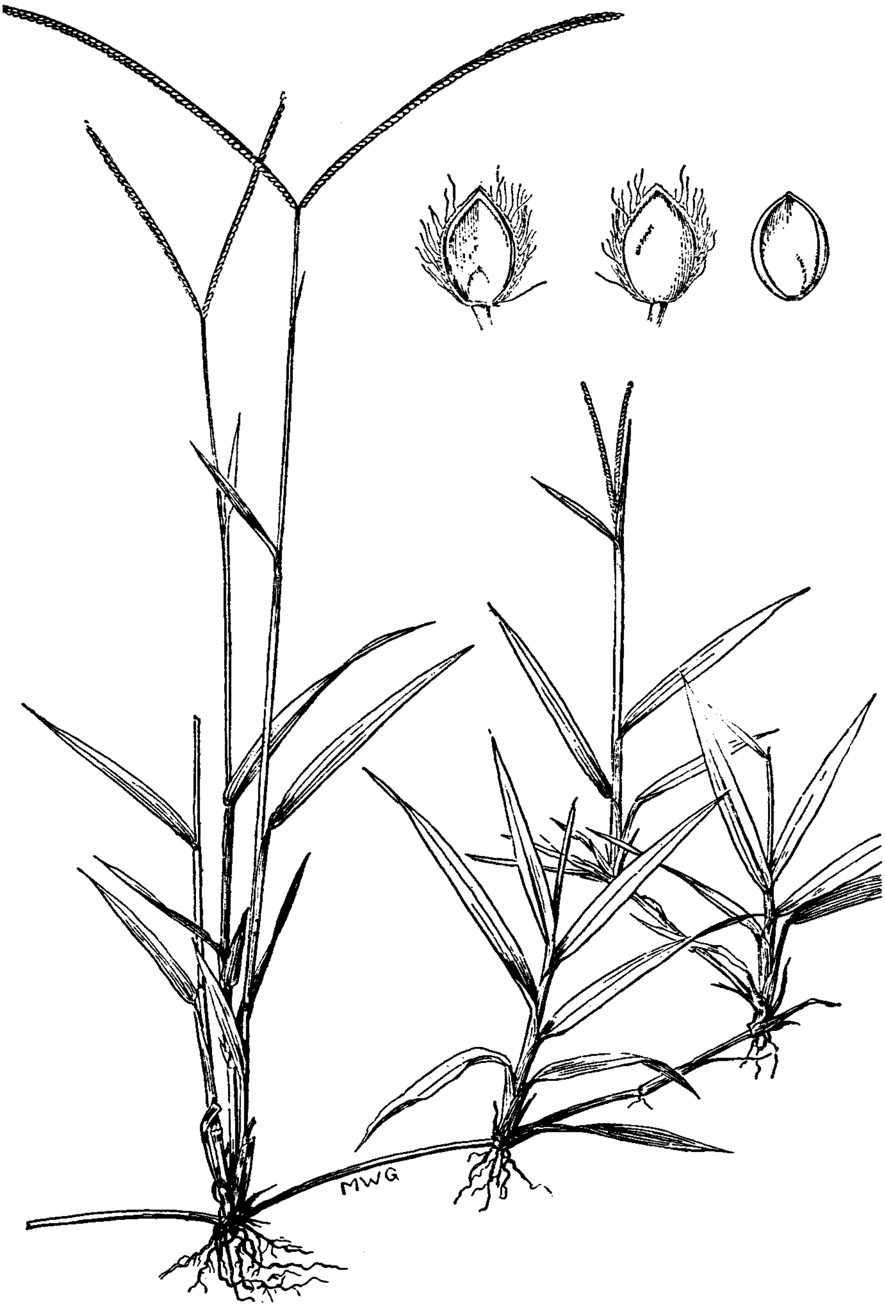
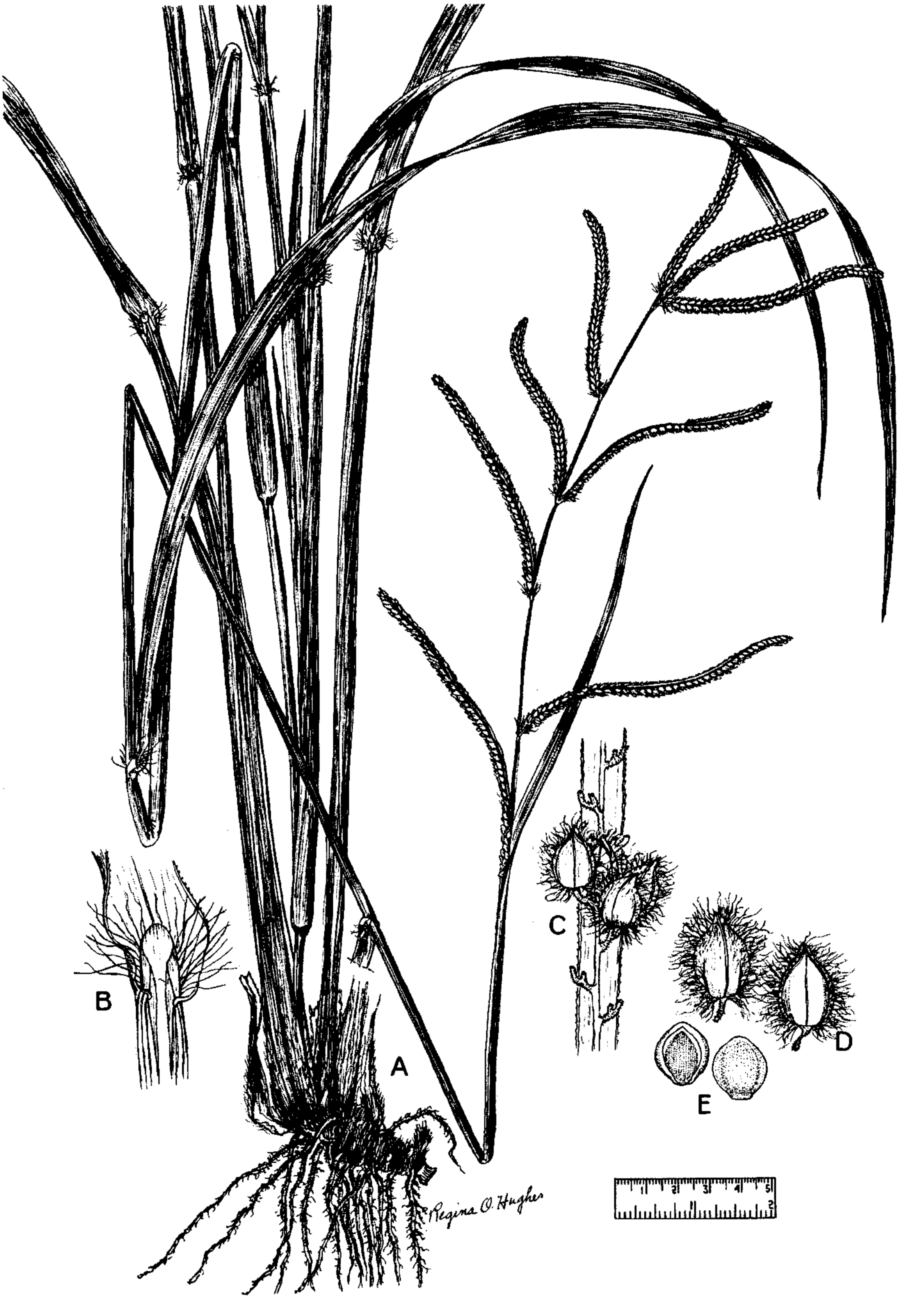


Fig. 64. **Paspalum conjugatum:** habit, spikelet (two views) and floret. (From Hitchcock and Chase)


B
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Regina O. Hughes
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Fig. 65. **Paspalum dilatatum:** A, habit; B, ligule; C, portion of raceme; D, spikelet (two views); E, floret (two views). (From Reed, *Selected Weeds of the United States* (1970) Fig. 36)

base, 5–15 dm tall. Sheaths glabrous; blades pilose at the base, somewhat scabrid on the margins, flat, to 25 cm long or longer, 4–12 mm wide. Inflorescence of (2–) 3–5 (–10) alternate, ascending to spreading racemes, the latter bearded at the base, 4–12 cm long. Spikelets yellowish green, in pairs thus in two rows on each side of the rachis, mostly 3–3.5 mm long, ovate; glume short- and sparsely-pubescent on the back and with a long silky-fringed margin.

Boggy and marshy open places, meadows, ditches, moist to wet roadsides, lawns, cultivated and disturbed places, borders of and clearings of lowland woodlands; also in well-drained sites. Native in S.Am., naturalized N.J. to Fla., to Calif. and Oreg.; Tenn., Ark., Okla. An important forage plant.

6. Paspalum urvillei Steud. VASEY GRASS. Fig. 66

Coarse tufted perennial with basal offshoots, sometimes with short, thick knotty rhizomes. Stems erect, 1–2 m tall, glabrous. Lower sheaths usually pubescent; blades elongate, to about 4 dm long, 3–15 mm wide, bearded at base, striate, the surfaces glabrous, margins smooth or nearly so. Inflorescence of (8–) 12–20 crowded closely ascending and overlapping racemes 3–12 cm long. Spikelets paired thus in four rows on the rachis, broadly elliptic to obovate, 2–3 mm long, their apices acuminate; glume appressed-pubescent on the back, the margins long silky-fringed.

Common in a wide variety of open disturbed habitats, usually where the soil is moist, wet at times; also seasonally wet savannas and flatwoods, pond and stream margins. Native in S.Am., naturalized Va. to s. Fla., w. to Tex., Okla., Ark.; Calif.

7. Paspalum monostachyum Vasey. Fig. 67

Glabrous perennial with slender scaly rhizomes. Stems 5–12 dm tall, slender and rigid. Sheath closely surrounding stem; blade elongate, narrow and inrolled, stiffish, almost like a very long needle-leaf. Inflorescence usually a single terminal, straight to arcuate raceme, occasionally a second below, the raceme 1–3 dm long. Spikelets about 3 mm long, long-elliptic to narrowly obovate, their apices obtuse, pale straw-colored at maturity, glabrous; alternating in pairs on each side of the rachis; one of the pair often with a first glume present, this to as much as ⅔ the length of the spikelet.

Wet prairies and marshes, seasonally wet depressions in limerock of pinelands, adjacent ditches and roadsides. S. Fla.; La., Tex.

8. Paspalum distichum L. KNOT-GRASS. Fig. 68

Plant with branches decumbent below and rooting at the nodes, flowering branches ascending to 5 dm tall; or commonly with creeping stems rooting at the nodes from which flowering stems arise, mat-forming; nodes of the creeping stems often bearded. Sheaths conspicuous, loose, variously pubescent to glabrous but usually pilose at the summit at least; blades relatively short, to about 6–8 dm long and 3–8 mm wide, usually folded below, strongly tapered to an inrolled tip; flat on the creeping stems. Inflorescence a terminal pair of divergent to ascending racemes (occasionally 1 or 3) 2–8 cm long. Spikelets solitary, in two rows on the rachis and appressed almost parallel to it; variable in length, mostly 2.5–3.0 mm long, their apices acute to short-acuminate; a first glume occasionally present, second glume glabrous or short-pubescent. (*P. vaginatum* Sw.)

Commonly in thick mats on marshy shores, in marshes, in shallow water and on wet sandy or mucky substrates, both brackish and fresh waters; ponds, ditches and wet clearings. Sometimes a pest in irrigation or drainage ditches and canals; occasionally serving as an efficient soil-binder. Semicosmopolitan in warm temperate and tropical areas.

Most authors distinguish *P. vaginatum* from *P. distichum* but it seems to us they do so "with considerable straining."

9. Paspalum notatum Flügge. BAHIA GRASS. Fig. 69

Mat- or sod-forming perennial with rhizomes thick and coarsely scaly with old leaf

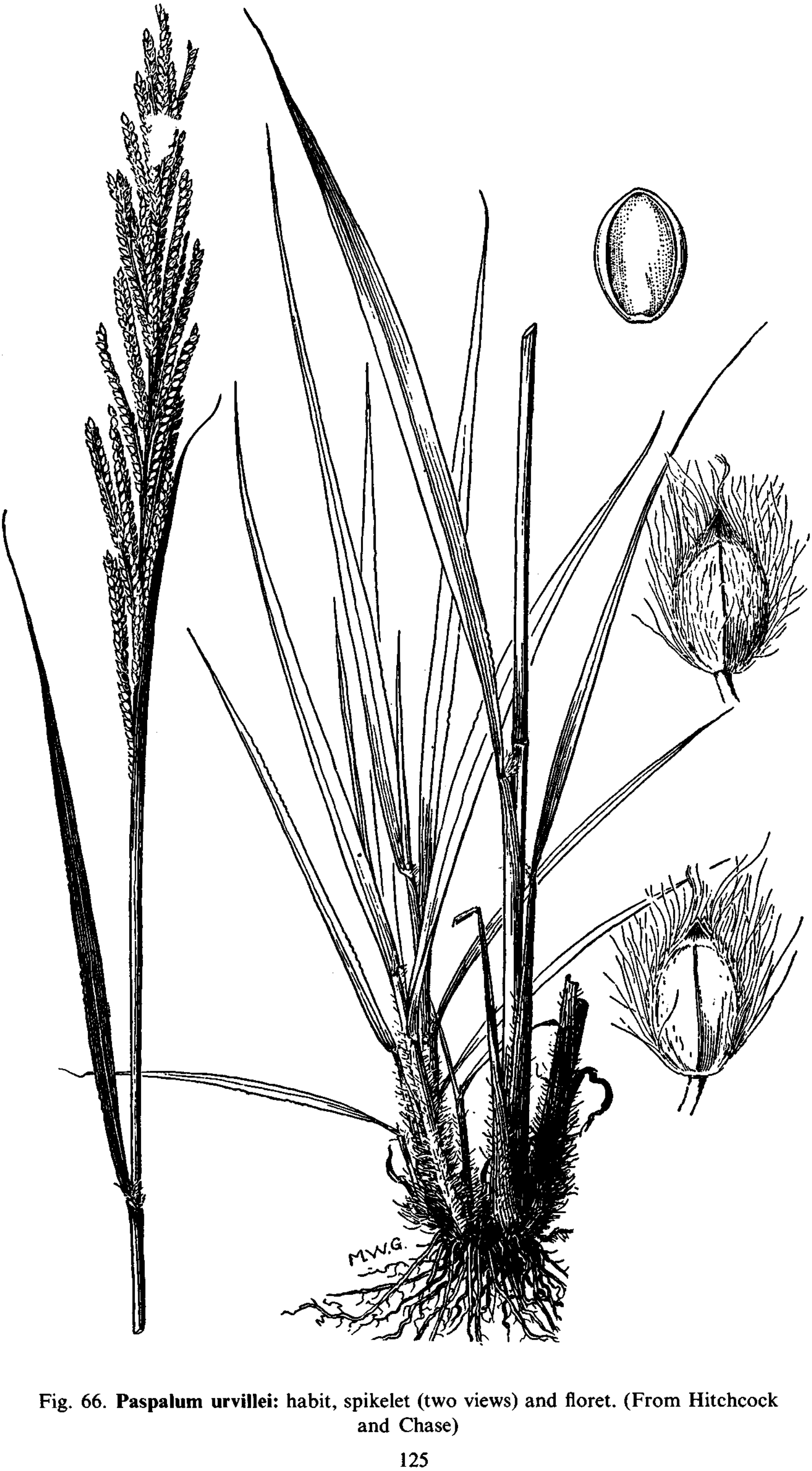

Fig. 66. **Paspalum urvillei:** habit, spikelet (two views) and floret. (From Hitchcock and Chase)

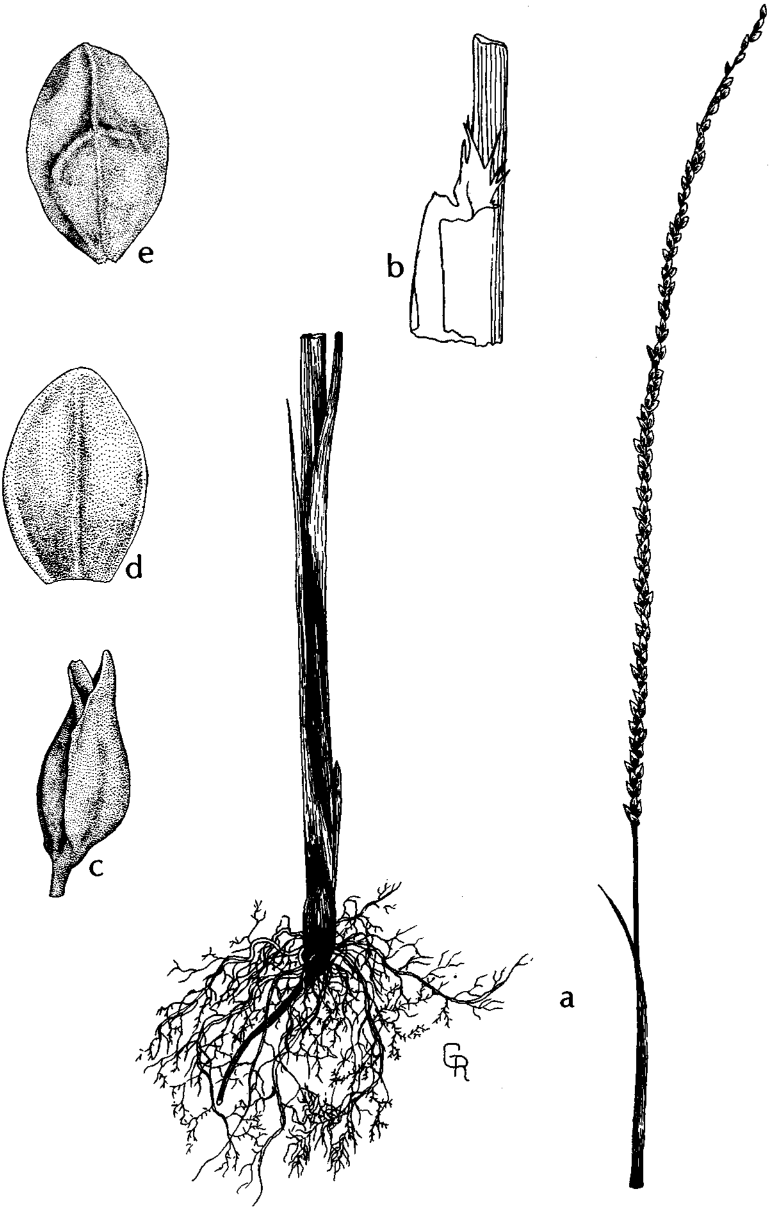

Fig. 67. **Paspalum monostachyum:** a, lower and upper portions of plant; b, ligule; c, spikelet, edge view; d, second glume; e, fertile lemma.

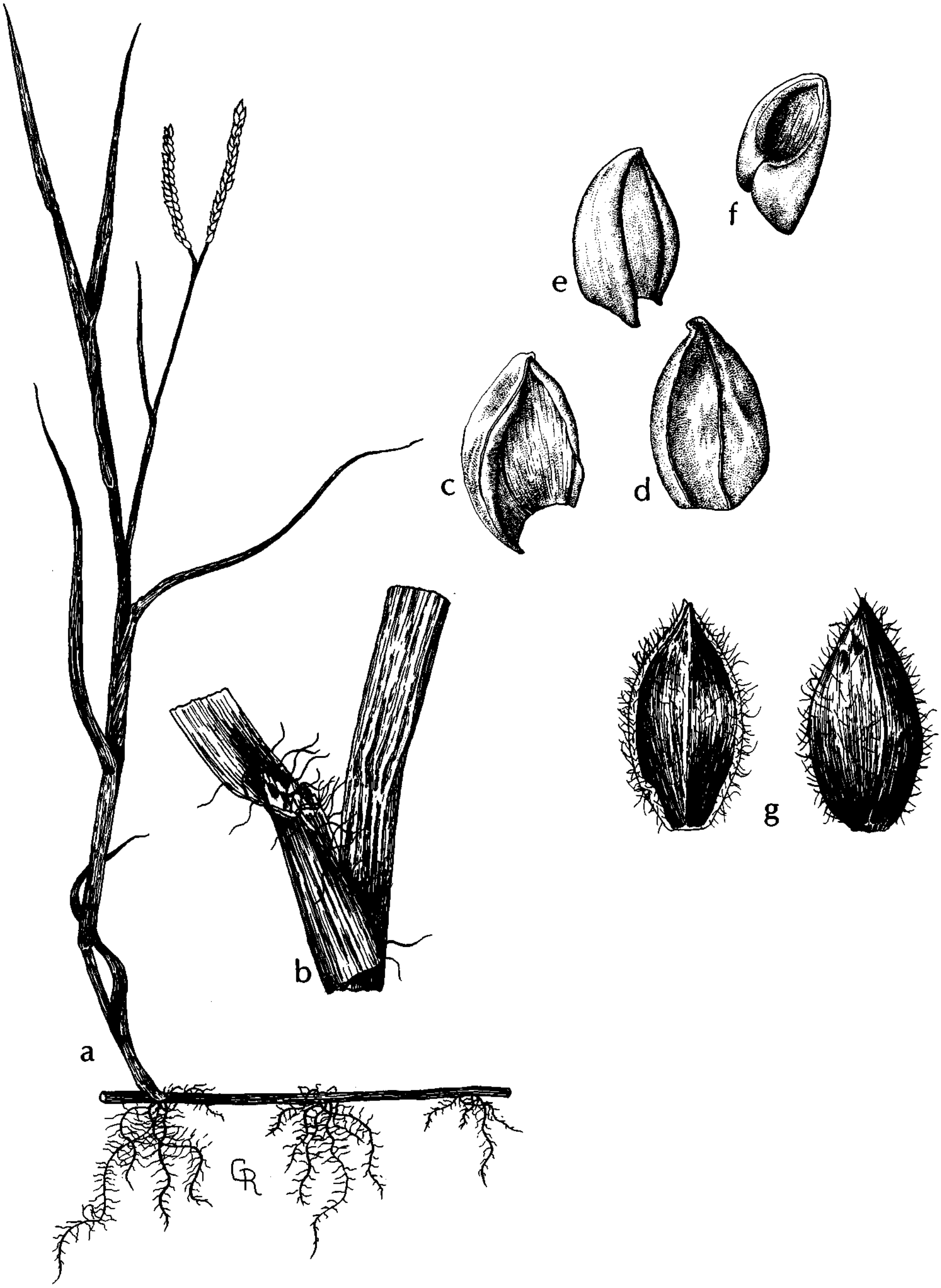

Fig. 68. **Paspalum distichum:** a, habit; b, ligule; c, glume; d, sterile lemma; e, fertile lemma; f, palea; g, spikelet (two views).

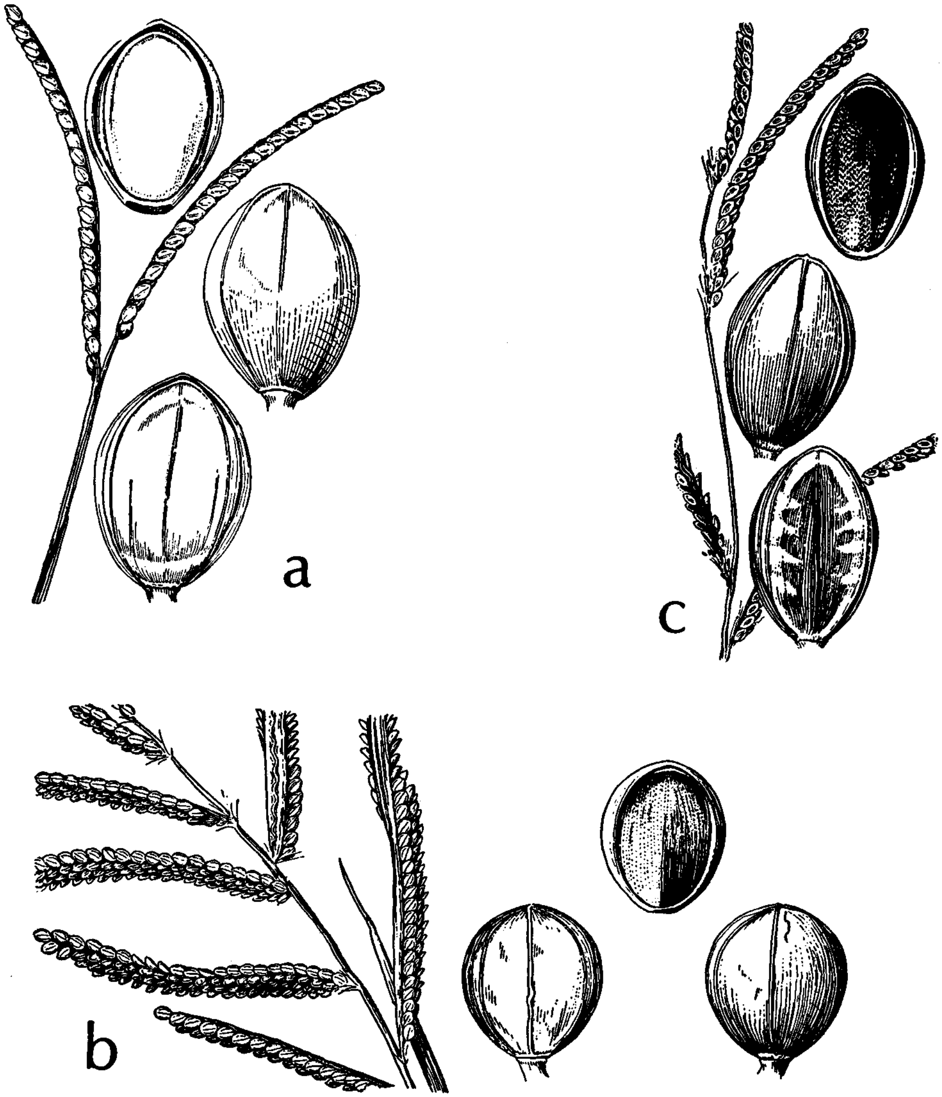

Fig. 69. a, **Paspalum notatum:** inflorescence, spikelet (two views) and floret; b, **Paspalum boscianum:** inflorescence, spikelet (two views) and floret; c, **Paspalum plicatulum:** panicle, spikelet (two views) and floret. (From Hitchcock and Chase)

bases. Stems glabrous, mostly 5–8 dm tall. Sheaths glabrous; blades flat or folded, to about 2.5 dm long, long-tapering, usually much shorter than the flowering stems, glabrous or pilose on or near the margins toward the base. Inflorescence very frequently with a terminal pair of strongly ascending racemes but not infrequently with 1–2 additional close-set racemes below; racemes 10–12 cm long for the most part. Spikelets solitary, alternating on either side of the rachis, thus in two rows; overlapping but angling outward from the rachis; oval, broadly elliptic or ovate, their apices obtuse; mostly chartaceous and sublustrous, 3 (–4) mm long.

Native in S.Am. Introduced as a forage plant; widely used on highway rights-of-way where there must be, perhaps chiefly in the coastal plain of the Southeast, tens if not hundreds of thousands of acres of it—to the virtual exclusion of other plants, especially where mowed frequently. It is not really a wetland plant, yet there is so very much of it that it impinges upon wet places, to say the least, in a vast number of places.

10. Paspalum laeve Michx. Fig. 70

Perennial forming close basal offshoots and thus tufted. Stems 3–10 dm tall, glabrous, the flowering stems much exceeding the leaves. Sheaths and blades glabrous or pilose, the blades flat or folded, the larger to 4 dm long, 3–10 mm wide. Inflorescence of (2–) 3–6 spreading racemes, alternate on the axis, 3–10 cm long. Spikelets solitary and in two rows on the raceme; suborbicular to obovate, as broad as long or nearly so, 2.5–3.0 mm long, glabrous. (*P. circulare* Nash; *P. longipilum* Nash)

In wet sands, sandy peats or mucks, depressions in pine savannas and flatwoods, cypress-gum ponds, ditches, borders of marshes. Mass. to cen. Fla., w. to e. and s.e. Tex; Ohio to Kans. and Mo.; Ky., Tenn. to Okla.

11. Paspalum boscianum Flügge. BULL PASPALUM. Fig. 69

Annual, with much purple pigment suffused in the stems and leaves. Stems weakly ascending; sometimes with numerous branches from the base, these spreading in all directions, rooting at the nodes, the flowering stems ascending and branched, glabrous. Sheaths conspicuous, usually long; blades flat or folded, 1–4 dm long, 6–12 mm wide, the margins finely scabrid. Inflorescence of (2–) 3–6 (–15) spreading racemes, the rachis winged but not as wide as the rows of spikelets. Spikelets paired thus in four rows (unless some aborted); about 2 mm long, their apices rounded; mature spikelets surficially appearing more or less rusty, the "fruit" lustrous dark brown, usually slightly exceeding the glume and sterile lemma.

Wet sandy, sandy-peaty, or mucky substrates, margins of ponds, in ditches, lowland woodlands, cypress-gum ponds, low wet places in cultivated fields. Va. and Tenn. to s. cen. Fla., w. to Ark. and e. Tex.; trop. Am.

12. Paspalum plicatulum Michx. BROWNSEED PASPALUM. Fig. 69

Tufted perennial, sometimes with short stout or slender rhizomes. Stem slender, glabrous, to about 6–8 dm tall, sometimes much shorter. Leaf blades usually folded below and inrolled above, elongate, to 15 cm long, narrow, mostly not exceeding 4 mm wide; lower sheaths frequently suffused with light purplish pigment. Inflorescence with 2–6 ascending-spreading distant racemes 1–6 cm long, the lower usually the longer. Spikelets in pairs thus in four rows on the raceme; elliptic to ovate, their apices obtuse, 2.2–3.0 mm long; glabrous, at maturity the glume and fertile lemma brownish centrally, paler near the margins, "fruit" lustrous dark brown.

In seasonally wet and well-drained pine savannas, flatwoods and sometimes pine uplands, adjacent ditches and roadsides, moist to wet clearings, prairies. S.e. S.C. to Fla., w. to e. Tex.; W.I., C.Am., S.Am.

13. Paspalum hydrophilum Henr. Fig. 71

Aquatic, the stems decumbent, to 2.5 m long, with "brushes" of roots at the nodes. Sheaths and blades glabrous to puberulent or somewhat pilose, the blades flat, 2–5 dm

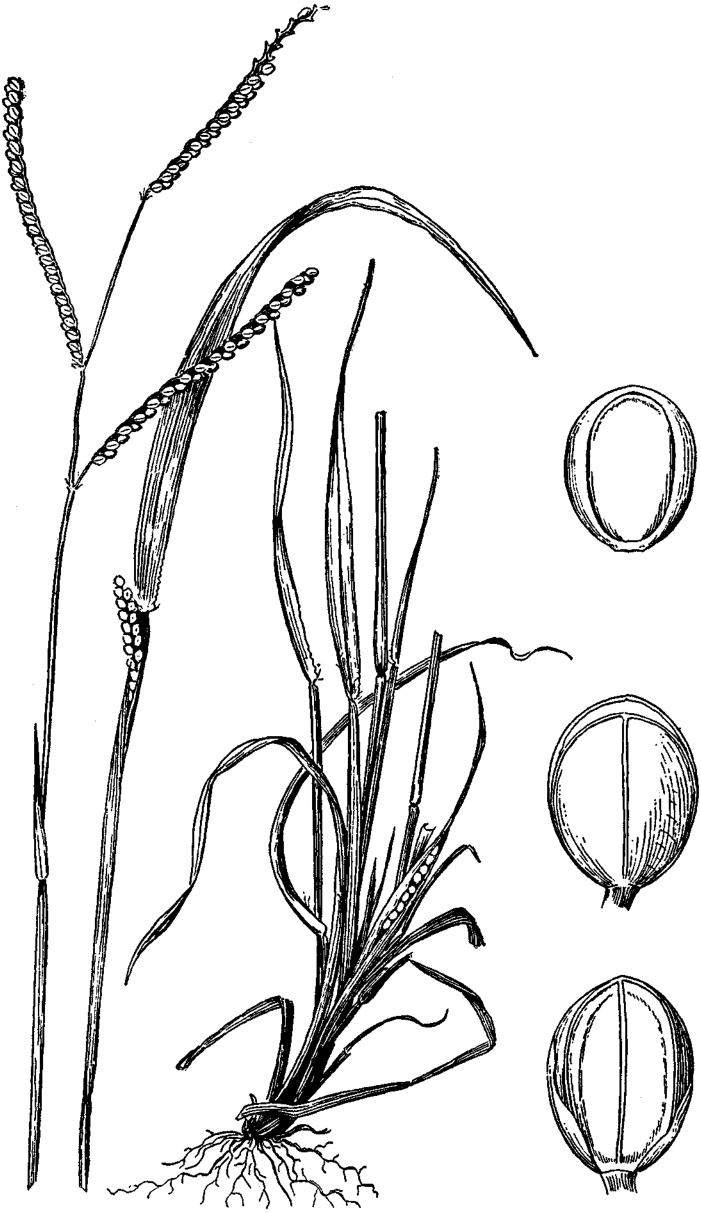

Fig. 70. **Paspalum laeve:** habit, spikelet (two views) and floret. (From Hitchcock and Chase)

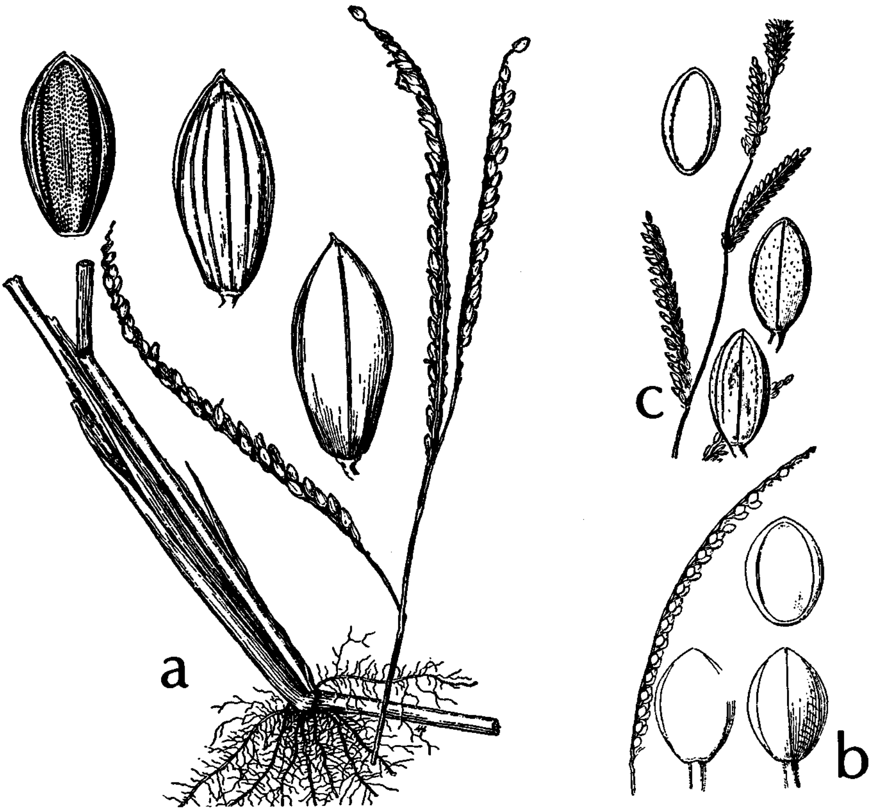

Fig. 71. a, **Paspalum hydrophilum:** inflorescence, spikelet (two views) and floret; b, **Paspalum setaceum:** inflorescence, spikelet (two views) and floret; c, **Paspalum caespitosum:** inflorescence, spikelet (two views) and floret. (From Hitchcock and Chase)

long and to 1 cm wide. Inflorescence with 2–4 approximate racemes 4–8 cm long. Spikelets in pairs thus in four rows on the raceme (though one of the pair often aborted); olive green, elliptical, nearly 3 mm long, "fruit" shining brown at maturity.

Naturalized in irrigation or roadside ditches, La. Native in S.Am., s. Brazil to Argen.

14. Paspalum setaceum Michx. Fig. 71

This if interpreted as a species is a complex highly variable one; its variant forms inhabit a wide range of ecological situations. Some authors regard the complex as comprising a number of species; others as a complex of varieties of one species. In either case it is apparent that the characters intergrade. The most recent analysis published is that of Banks (1966). Below we adopt his generalized description and in passing note that he found the greatest diversity in Florida where occur eight of the nine varieties he recognizes. We do not attempt here to distinguish the varieties. We give below Banks' generalized description for the species and following that the varietal names used by him.

> Yellowish green to green to purplish perennials with culms tufted, prostrate, spreading, ascending, or erect from a knotty base or short rhizomes, up to 90 cm tall; inflorescence terminal and axillary; racemes 3–17 cm long, slender, 1–5 on the terminal peduncles, usually single on the axillary ones, sometimes hidden in the leaf sheaths; spikelets usually in pairs, the lower sometimes absent, planoconvex, glabrous or pubescent, sometimes spotted, straw-colored to green to brownish to purple, elliptic to orbicular, 1.4–2.7 mm long, 1.0–2.0 mm wide; sterile lemma nerveless to prominently nerved, first glume usually absent; fertile floret about the same size and shape as the spikelet, smooth and shining; leaf blades flat, ascending to spreading, glabrous to puberulent to coarsely pubescent, flexuous to rigid, 5–30 cm long, 2–20 mm wide; ligule a minute membrane with long white hairs back of it; leaf sheaths glabrous or pubescent, the lower ones often purplish brown.

P. setaceum var. *setaceum; P. setaceum* var. *longepedunculatum* (LeConte) Wood; *P. setaceum* var. *villosissimum* (Nash) D. Banks; *P. setaceum* var. *psammophilum* (Nash) D. Banks; *P. setaceum* var. *stramineum* (Nash) D. Banks: *P. setaceum* var. *ciliatifolium* (Michx.) Vasey; *P. setaceum* var. *muhlenbergii* (Nash) D. Banks; *P. setaceum* var. *supinum* (Bosc.) Trin.; *P. setaceum* var. *rigidifolium* (Nash) D. Banks. Central and e. U.S.; Mex., C.Am., W.I.

15. Paspalum caespitosum Flügge. Fig. 71

Perennial, usually with several-numerous leafy-based stems forming a clump. Stems glabrous, 4–10 dm tall, striate, the flowering stems filiform, much exceeding the lower leaves. Basal sheaths pubescent or glabrous, blades flat, 4–10 mm wide, variable in length, striate, usually somewhat glaucous and with a bluish cast, the margins finely scabrous and with some cilia, these usually deciduous. Inflorescence terminal, with 2–5 (–8) relatively distant, very slender, spreading to ascending racemes 2–6 cm long. Spikelets in pairs on either side of the axis, very small, 1.0–1.5 mm long, elliptic or oval to obovate, the glume finely glandular-pubescent surficially, usually becoming glabrous at maturity. (Incl. *P. blodgettii* Chapm.)

In seasonally wet shallow soils or in depressions on limerock of pinelands and hammocks, adjacent disturbed places. S. Fla.; W.I., C.Am.

16. Paspalum fimbriatum HBK. WINGED PASPALUM. Fig. 72

Tufted annual with soft bases and leafy stems 1–8 dm tall. Sheaths and lower to median portions of leaf blades ciliate on the margins; blades flat, the larger 10–15 cm long and 8–10 mm wide. Inflorescence of 3–several racemes 3–5 cm long. Spikelets in pairs on each side of the rachis; the glume and sterile lemma each with a very distinctive broad lobed wing, the lobes more or less fimbriate and setose on the outer edges, yellowish to purple; spikelets, including the wing, 2–3 mm long, approximately orbicular.

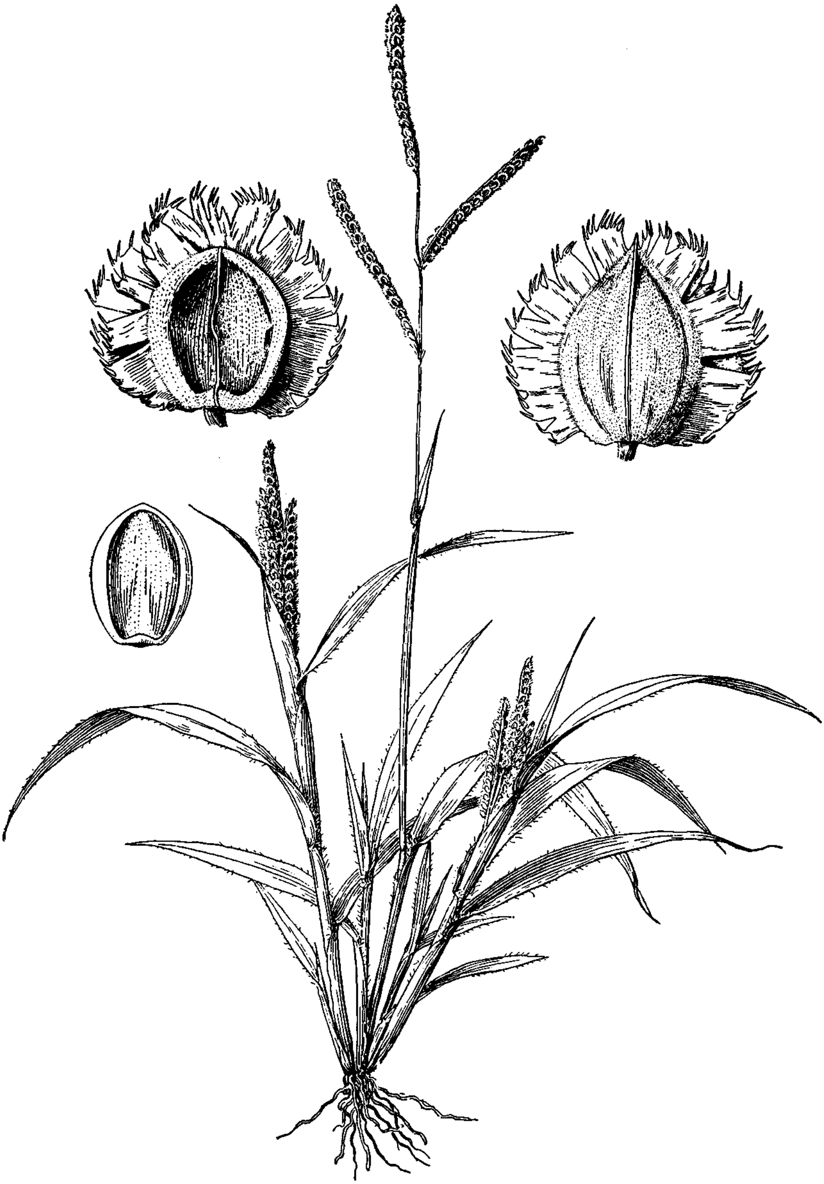

Fig. 72. **Paspalum fimbriatum:** habit, spikelet (two views) and floret. (From Hitchcock, *Manual of the Grasses of the West Indies,* U.S.D.A. Misc. Publ. No. 243 (1936) Fig. 195)

A recent introduction from tropical America. In cultivated and disturbed places; apparently sometimes on the seasonally wet shallow soils on limerock of pinelands and hammocks, s. Fla.

17. Paspalum pubiflorum Rupr. ex Fourn. Fig. 73

Plant with zigzagging decumbent stout branches from near the base, rooting at the nodes, the flowering stems ascending, to 1 m tall. Sheaths and lower portions of the blades pilose, especially on the margins, the hairs pustular-based, deciduous, leaving the pustular bases; blades flat, 6–30 cm long and to 1.5 cm wide, the margins thin-cartilaginous and finely scabrid. Inflorescence of 3–6 (–8) flexuous racemes 2–10 cm long. Spikelets in pairs on each side of the rachis; broadly elliptic, oval or obovate, 2.5–3.0 mm long, their apices blunt, pubescent or glabrous.

Open low, wet places, banks of streams, irrigation or drainage ditches, margins of ponds and lakes, wet meadows, lowland woods, roadsides adjacent to these. Ohio to Kans., s. to Tex. Apparently sporadic Va., Tenn., N.C. (? to Fla.); w. through the Gulf States.

18. Paspalum bifidum (Bertol.) Nash. Fig. 73

Perennial with slender pubescent-scaly rhizomes. Stems to 12 dm tall, stiffish, glabrous. Sheaths pilose; blades flat, elongate, the larger to 2 dm long and 15 mm wide, striate, the surfaces proper more or less glaucous, the lower usually pubescent, pilose or with both long and short hairs, the upper glabrous, sparingly pilose or with dense short pubescence; margins smooth. Inflorescence with 2–6 racemes of variable length, up to about 10–12 cm long, the spikelets in alternating pairs (single if one abortive), the pairs usually relatively distant and little if at all overlapping each other, sometimes as much as 8 mm distance from the top of one pair to the base of the next. Spikelets 3.5–4.0 mm long, broadly oval or elliptic seen from the flat side, the other side very turgidly convex and approaching obovate in outline, the apices obtuse; a very small triangular or truncated first glume may be present on one or both spikelets of the pair, or absent from both; convex side of the spikelet with 3–7 green nerves, at least one pair of nerves more or less midway between the midnerve and the margin.

In both seasonally wet and well-drained pinelands, also moist sands near seepage bogs, clearings of lowland woodlands, in mud of sloughs, stream and pond margins. Coastal plain, s.e. Va. to n. Fla.; w. to e. Tex., Okla., Ark. and Tenn.

P. langei (Fourn.) Nash, a plant of well-drained woodlands (and perhaps of rare occurrence from c. Fla. to Tex.) has spikelets with green nerves (5) on the convex side much as in *P. bifidum* but the spikelets are much smaller, 2–2.5 mm long, and overlap. Each spikelet of the pair has a triangular first glume but that of one of the pair is keeled and acuminate, one-third the length of the spikelet or a little more, that of the other of the pair is not keeled, is very broadly triangular and minute. We notice that specimens of *P. langei* are sometimes misidentified as *P. bifidum.*

19. Paspalum floridanum Michx. Fig. 73

Robust perennial with thickish pubescent-scaly rhizomes. Stems mostly 8–15 (–20) dm tall, glabrous. Sheaths and blades of some plants conspicuously pilose, of others glabrous or glabrous and with strongly setose margins; blades 1–5 dm long and 4–15 mm wide. Inflorescences mostly much exceeding the leaves, with 2–5 or 6 stiffish ascending racemes 4–15 cm long. Spikelets in pairs on either side of the rachis, 3–4 mm long, orbicular, broadly oval or elliptic, their apices rounded to obtuse; spikelets and rachis glaucous, the glaucousness sometimes becoming brown or peeling off with age. (Incl. *P. difforme* Le Conte; *P. giganteum* Baldw. ex Vasey)

In wet, seasonally wet, and well-drained pine savannas, flatwoods or ridges; in permanently wet depressions, marshy shores, prairies, sometimes in shallow water; in open hammocks with grassy understory. S. N.J. s. to s. Fla., w. to Tex., n. in the interior to s.e. Kans., s. Mo. and Ill.

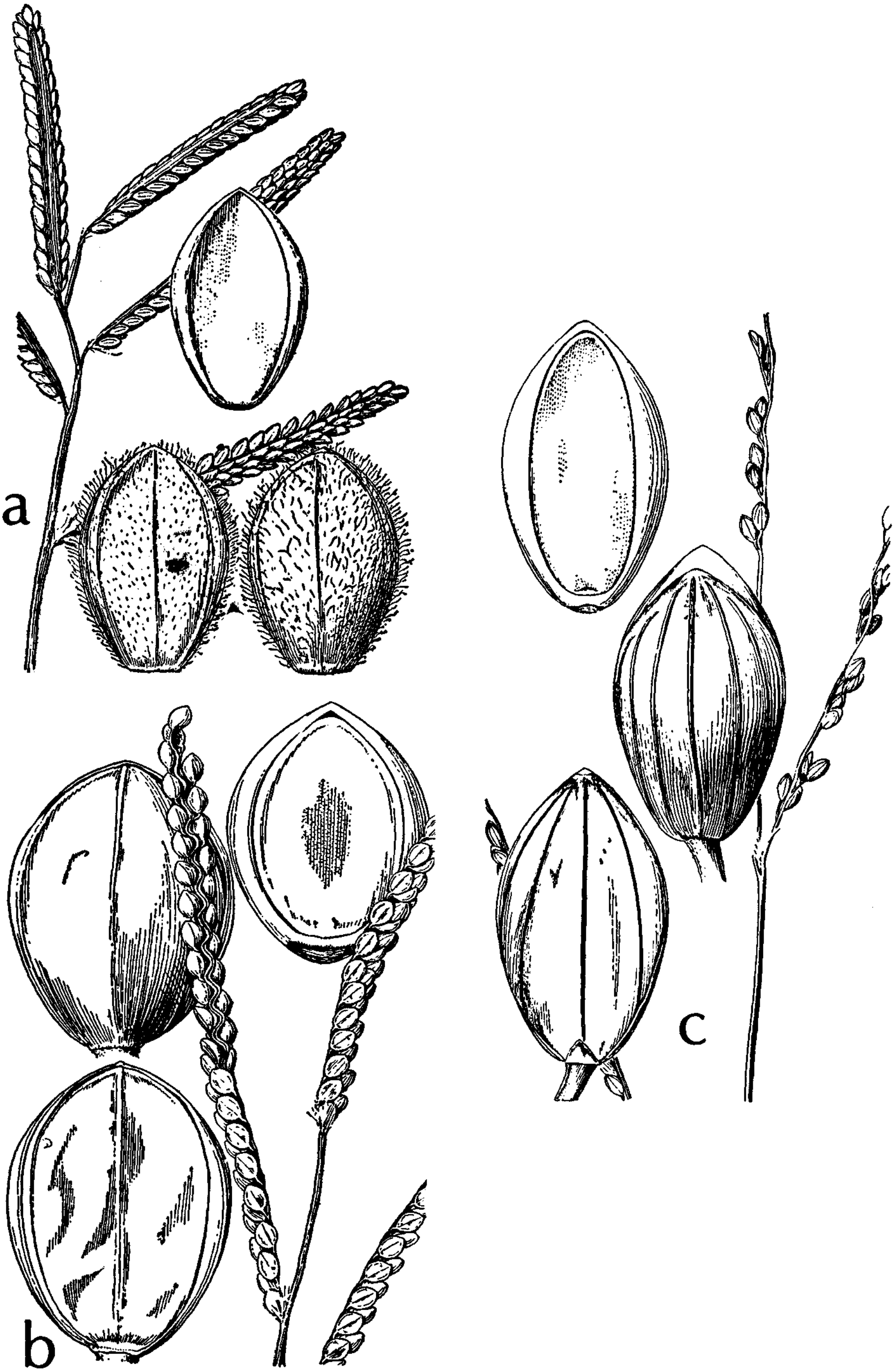

Fig. 73. a, **Paspalum pubiflorum:** portion of inflorescence, spikelet (two views) and floret; b, **Paspalum floridanum:** portion of inflorescence, spikelet (two views) and floret; c, **Paspalum bifidum:** portion of inflorescence, spikelet (two views) and floret. (From Hitchcock and Chase)

20. Paspalum praecox Walt. Fig. 74

Perennial, with short rather slender rhizomes and forming tufts. Stems 6–10 dm tall, glabrous or the nodes sometimes bearded. Sheaths and blades glabrous in some plants, in others the lower sheaths and blades conspicuously pilose with pustular-based hairs, the hairs sometimes deciduous leaving the pustular bases; blades mostly elongate, 1–3 dm long and 1–4 mm wide. Inflorescences much exceeding the leaves, with (2–) 4–6 yellowish green flexuous racemes. Spikelets in pairs on either side of the rachis, obovate to suborbicular, mostly 2.5–3 mm long, their apices broadly rounded, yellowish green. (Incl. *P. lentiferum* Lam.)

Cypress-gum ponds or depressions, seasonally wet pine savannas and flatwoods, ditches and roadsides adjacent to these. Coastal plain, s.e. Va. to s. cen. Fla., w. to s.e. Tex.

21. Paspalum lividum Trin. ex Schlecht. LONGTOM. Fig. 74

Tufted perennial, to about 1 m tall, lower stems often decumbent and rooting at the nodes, extending for about 1 m then producing flowering branches. Sheaths loose, sheaths and blades glabrous, the blades flat or folded, 10–25 cm long, 3–6 mm wide. Inflorescences usually with 3–8 flexuous racemes 1.5–5 cm long. Spikelets in pairs on either side of the rachis; elliptic, 2–2.5 mm long, their apices tapered-obtuse, yellowish green, sometimes purple blotched.

Swamps, irrigation and drainage ditches, wet savannas, wet pasturelands. Ala. to Tex.; Mex. to Argen.

20. Paspalidium

Paspalidium geminatum (Forssk.) Stapf in Prain. Fig. 75

Aquatic or subaquatic rhizomatous perennial. Stems to 1 m tall, slender or to 1 cm across basally, somewhat succulent; bases commonly decumbent, rooting, and elongate. Ligule a ring of hairs. Leaf blades 1–4 dm long, flat medially, usually the long-tapering tips involute. Principal axis of the inflorescence unbranched and bearing alternately, relatively short-ascending or appressed-ascending flattish, spikelike fertile branches; spikelets alternate in two rows on one side of the sharply 3-angled rachis whose apex is usually pointed and free beyond the seating of the uppermost spikelet; spikelet plano-convex or nearly so, 2–3 mm long, ovate to oblong-elliptic; first glume short, as broad as long or broader than long, its summit truncate to very broadly rounded, borne on the side of the spikelet away from the rachis and the fertile lemma thus toward the rachis; fertile lemma and palea very finely horizontally rugose. (*Panicum geminatum* Forsk.; incl. *Paspalidium paludivagum* (Hitchc. & Chase) Parodi)

Moist to wet sites, often in water, sometimes in floating islands, marshy shores of streams, ponds, lakes, drainage, ditches and canals. Cen. and s. Fla., La., Tex., Okla.; warmer regions of both hemispheres.

21. Panicum

A large and complex genus of annuals or perennials, variable in habit, many with branching flowering stems; perennial ones with relatively short to long rhizomes or stolons, or in tufts and lacking runners. Ligule usually a ring of hairs or a scalelike collar. Inflorescence commonly an open panicle, sometimes a close or condensed panicle. Spikelets with the back of the fertile lemma toward the axis. Glumes two, nerved, usually very unequal in size, the first commonly (not always) very small, the second usually equalling the similar first lemma or nearly so. First lemma opposite a very tiny membranous palea, these rarely subtending a staminate floret, or the first palea absent; the first lemma usually referred to as the sterile lemma. Spikelet with a single bisexual terminal floret whose lemma and palea are hard and cartilaginous, the margins

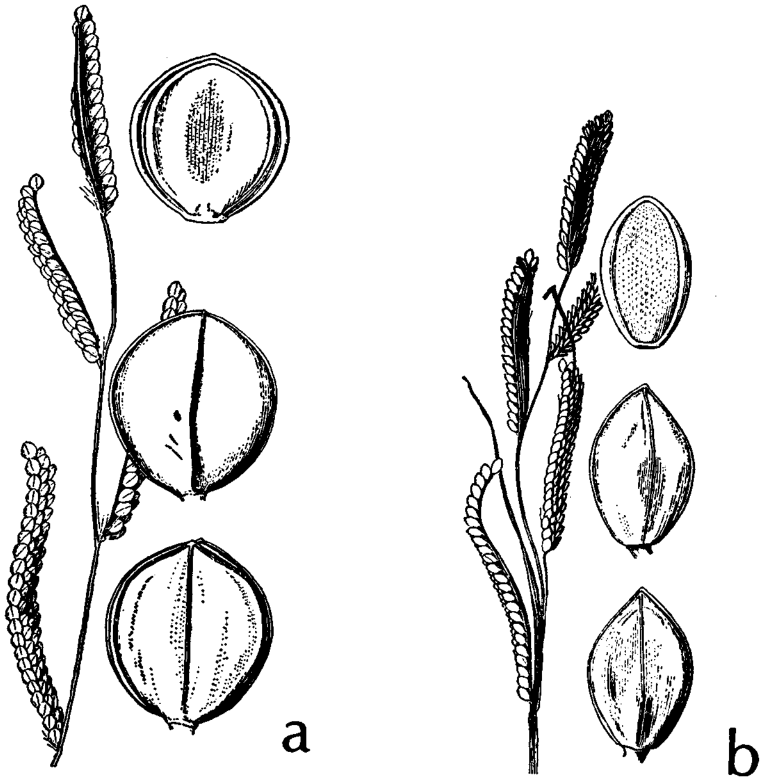

Fig. 74. a, **Paspalum praecox:** inflorescence, spikelet (two views) and floret; b, **Paspalum lividum:** inflorescence, spikelet (two views) and floret. (From Hitchcock and Chase)

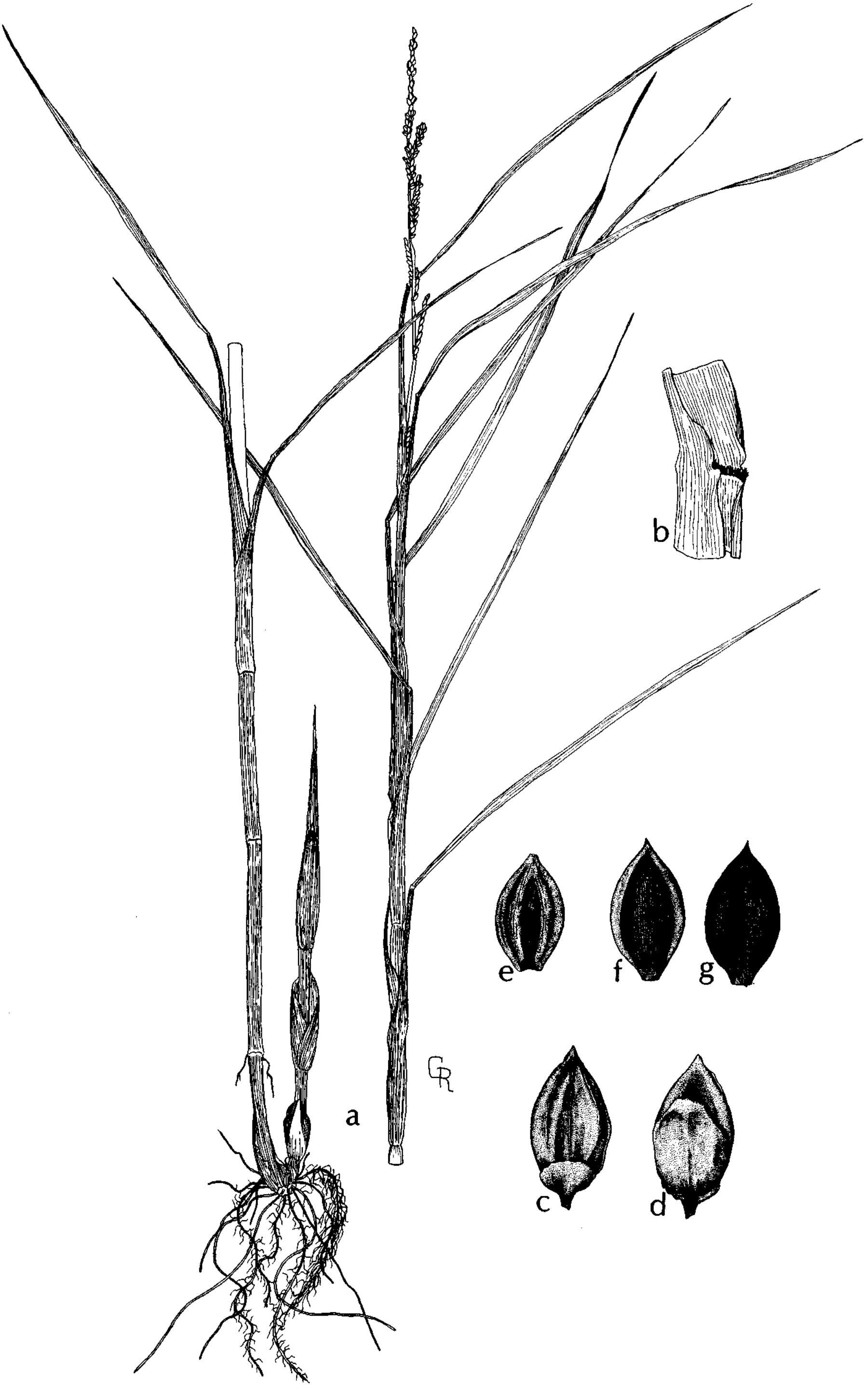

Fig. 75. **Paspalidium geminatum:** a, habit; b, ligule; c–d, spikelet (two views); e, palea of staminate flower; f–g, floret (two views).

of the lemma inrolled over and enclosing the palea, the two firmly enveloping the grain. Fertile lemma usually obtuse or rounded at the tip and smooth, occasionally rugose. Disarticulation is below the glumes.

In preparing this treatment of wetland Panicums we have agonized not a little in deciding which to include and which to exclude on the basis of the kinds of places they inhabit. In the end we rather arbitrarily excluded some which may, at least some of the time, inhabit moist to wet places. This was done in the interest of keeping the treatment from being more than minimally cumbersome, difficulties in identification being what they are in this complex group. In addition, by way of apology, we profess no real expertise as students of grasses generally, certainly very little indeed with regard to this genus. In seeking guidance from the works of various authors as to delimitation of the taxa, we encountered so much variability of interpretation that our frustrations were in no measure diminished.

1. Basal leaves like those of the stem though sometimes smaller or larger, not in rosettes; spikelets all or nearly all fertile.

2. Spikelet with wartlike tubercles or tuberculate-based stiffish hairs on the surfaces of the second glume and sterile lemma.

3. The spikelets with wartlike tubercles but not hairy. 1. *P. verrucosum*

3. The spikelets with tubercle-based stiffish hairs on the second glume and sterile lemma. 2. *P. brachyanthum*

2. Spikelets neither tuberculate nor with conspicuously tuberculate-based stiffish hairs.

4. Plants conspicuously rhizomatous.

5. First glume truncate apically or very very broadly obtuse. 3. *P. repens*

5. First glume obtuse or acuminate apically.

6. The first glume obtuse.

7. Panicle narrow, the branches usually appressed-ascending, not exceeding 10 mm broad, usually less, or if (rarely) branches longer and spreading, then these very narrow; leaf blades partially or wholly involute, mostly about 1 mm wide. 4. *P. tenerum*

7. Panicle open and diffuse; leaf blades flat, 4–12 mm wide. 5. *P. anceps*

6. The first glume acuminate.

8. Spikelets about 2 mm long; panicle narrow, about 1 cm broad. 6. *P. hemitomon*

8. Spikelets 3–5 mm long; panicle open and diffuse. 7. *P. virgatum*

4. Plants not rhizomatous.

9. Annuals, stems usually geniculate and decumbent below, rooting at the lower nodes.

10. Spikelets or small fascicles of spikelets mostly secund on the lower side of the branches, 5–7 mm long; first glume ¾ the length of the spikelet or more, subulate or long-acuminate apically, keeled and strongly 3-nerved. 8. *P. gymnocarpon*

10. Spikelets not secund on the branches, 2.5–3.0 mm long; first glume very short, about ¼ the length of the spikelet, obtuse to broadly rounded apically, not keeled, weakly if at all nerved. 9. *P. dichotomiflorum*

9. Tufted perennials, stems erect.

11. Spikelets acute; first glume obtuse to rounded apically; panicle branches capillary, very flexuous, often drooping. 10. *P. hians*

11. Spikelets acuminate; first glume acute to acuminate; panicle branches filiform, stiffish.

12. Ligule a scalelike membrane, usually coarsely to finely lacerate at the summit; leaf blades usually (not always) wider than their sheaths. 11. *P. rigidulum*

12. Ligule a fringe of cilia; leaf blades usually not wider than their sheaths. 12. *P. longifolium*

1. Basal leaves usually different in shape from those of the stem, closely crowded and forming rosettes (at least early in the season); "vernal" stems simple and with terminal panicles, their spikelets not producing seeds; "autumnal" or later phase branching and producing much reduced panicles, these often only partially exserted from the sheaths and producing seeds.

13. Leaf blades with a ligulelike ring of hairs 2–3 mm long at base, these protruding from the summit of the sheath and evident with a lense without removing the blade. 13. *P. spretum*

13. Leaf blades basally not as above, ligule if present minute and not protruding from the summit of the sheath.

14. Blades of principal stem leaves cordate- or subcordate-clasping at the base.

15. Larger leaf blades (on the stem) 10–15 cm long, 15–30 mm wide. 14. *P. polyanthes*

15. Larger leaf blades (on the stem) 3–8 cm long, 5–10 mm wide. 15. *P. erectifolium*

14. Blades of principal stem leaves truncate, rounded or narrowed at the base.
  16. Stems 8–12 dm tall.
    17. Second glume and sterile lemma considerably longer than the "fruit." 16. *P. scabriusculum*
    17. Second glume and sterile lemma barely if at all exceeding the "fruit."
      18. Stems (except nodes), sheaths and blades copiously soft-velvety-pubescent. 17. *P. scoparium*
      18. Stems, sheaths and leaves if pubescent not as above. 18. *P. dichotomum*
  16. Stems 1–5 dm tall.
    19. Leaf blades markedly ciliate marginally, surfaces usually pilose. 19. *P. strigosum*
    19. Leaf blades not ciliate, or ciliate only at the base, surfaces if pubescent short-pubescent, not pilose.
      20. Spikelets 1 mm long; leaf blades erect. 20. *P. chamaelonche*
      20. Spikelets 1.3–2.0 mm long; leaf blades spreading, moderately ascending, or reflexed.
        21. Stems 2–4 dm tall, usually 3 dm or less; spikelets 1.3–1.5 mm long. 21. *P. ensifolium*
        21. Stems 4–10 dm tall, rarely as short as 4 dm; spikelets 1.5–2.0 mm long. 18. *P. dichotomum*

1. Panicum verrucosum Muhl. Fig. 76

Annual, generally wiry-stemmed, very variable in stature, relatively unbranched and erect growing amidst dense vegetation, much branched, sprawling and intertwining with other plants of its kind when in nearly pure stands; slender prop roots forming on lower nodes sometimes, lower stems often decumbent and rooting at the nodes, midstem nodes well off the substrate sometimes with aerial roots. Leaf sheaths loose, commonly detached from around the stems, blades flat, variable in length from 5–20 cm long, mostly 4–8 mm wide, finely scabrous marginally; ligule fimbriate-ciliate, very short. Panicles very open and diffuse, varying a very great deal in overall dimensions, commonly very wide-spreading, the branches capillary and bearing but a few distant spikelets distally on the branchlets. Spikelets obovate, about 2 mm long; first glume short-ovate, less than 1 mm long, not nerved, obtuse apically; second glume and sterile lemma equal, obovate, obtuse apically, their outer surfaces dotted with wartlike tubercles.

Commonly pioneering and forming nearly pure stands on shores of ponds, lakes, streams, exposed during periods of low water, similarly frequently in moist to wet places of much mechanical soil disturbance or after fires; also depressions in pine savannas or flatwoods, dried up cypress-gum ponds, spoil banks, temporary pools, borrow pits, ditches, sloughs. S.w. Mich., n.w. Ind., s. Ohio, Ky., Ark., s. Ont., Mass. thence southward to Fla. and Tex.

2. Panicum brachyanthum Steud. Fig. 76

Annual. Stems 3–10 dm tall, glabrous, slender-wiry, weak, branched at least near the base, sometimes the lower parts decumbent and rooting at the nodes. Leaf blades flat, 5–15 cm long, 2–3 mm wide, glabrous. Panicles open, the branches distant, filiform, widely spreading, bearing a few spikelets distally. Spikelets about 3.5 mm long, broadest at the middle and tapered to both ends, the bases acute, the apices short-acuminate; first glume very small, pubescent, obtuse apically; second glume and similar sterile lemmas about equal, weakly nerved, their surfaces clothed with conspicuously tuberculate-based stiffish hairs.

Usually in well-drained places, sandy woodlands; also boggy swales, wet sands of bog margins, grassy exposed shores. La., Tex., Ark., Okla.

3. Panicum repens L. TORPEDO GRASS. Fig. 76

Perennial with long (occasionally short and knotty) rhizomes, sometimes with very elongate surface runners, forming extensive colonies. Stems 3–8 dm tall, glabrous. Sheaths glabrous or pubescent mostly near the summit or marginally, lower stems commonly with bladeless sheaths; leaf blades mostly relatively short, flat to tightly

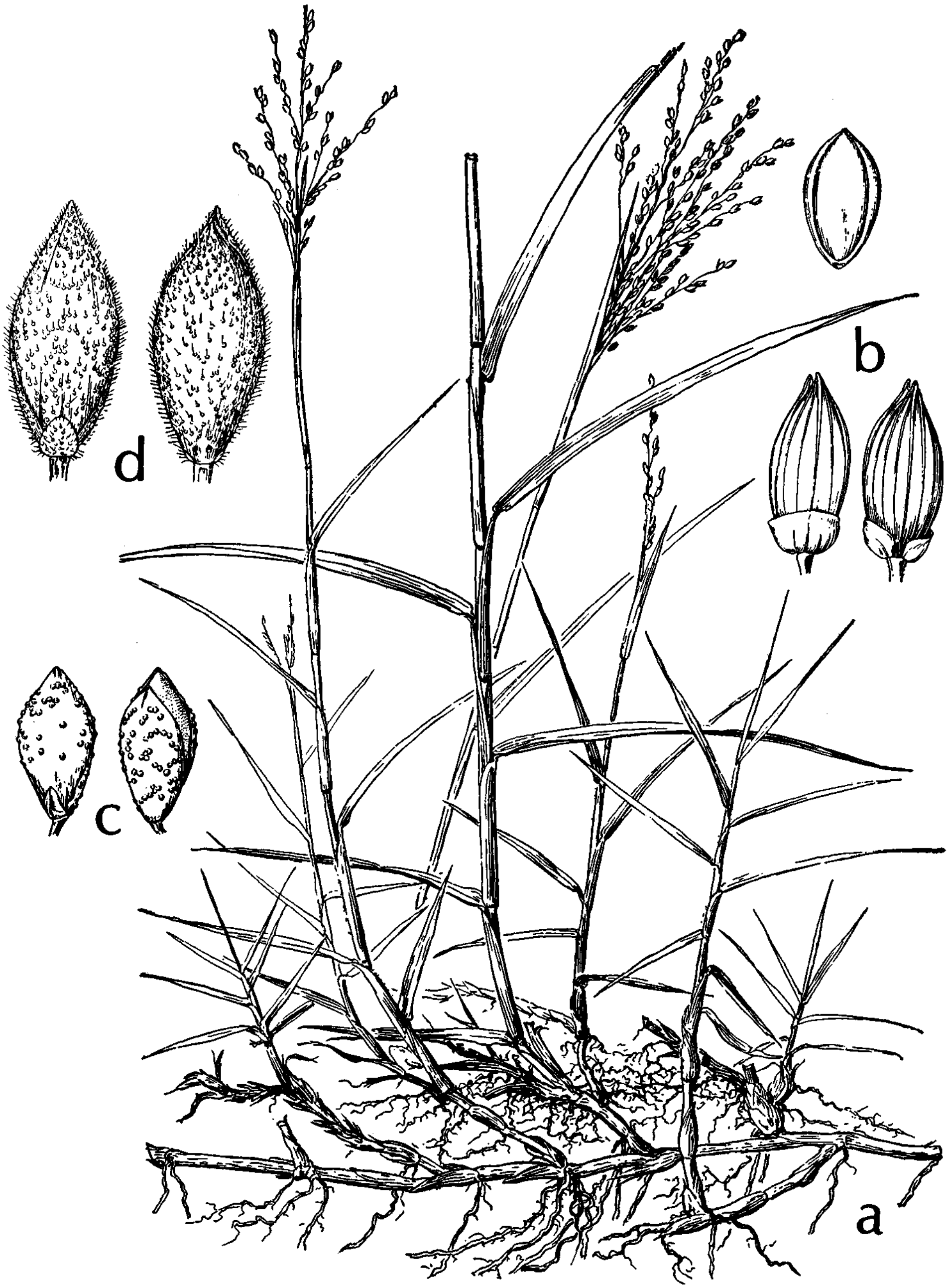

Fig. 76. a–b, **Panicum repens:** a, habit; b, spikelet (two views) and floret; c, **Panicum verrucosum:** spikelet (two views); d, **Panicum brachyanthum:** spikelet (two views). (From Hitchcock and Chase)

involute, 1 mm wide folded to 3 mm wide flat. Panicles variable in overall size, usually not large, mostly obpyramidal, 3–8 cm long, loose but the branches generally strongly ascending, sometimes diverging-ascending. Spikelets close to relatively distant on the filiform branchlets, elliptic-ovate but soon gaping distally, about 2.5 mm long; first glume short, surrounding much of the base of the spikelet, apically almost truncate; second glume and sterile lemma about equal, apically acute or very short-acuminate, usually 9-nerved.

Moist sandy beaches and shores of lagoons, spreading on to dunes, interdune swales, marshy shores of lakes and ponds, drainage canals and ditches, tidal flats, the surface runners often very long on wet sands or out into the water. Fla. to Tex., mostly, but not exclusively, coastal; trop. and subtrop. coasts both hemispheres, possibly introduced in Americas.

4. **Panicum tenerum** Beyr. ex Trin. Fig. 77

Perennial with short knotty rhizomes, making linear tufts. Stems slender, wiry-erect, mostly 5–6 dm tall, glabrous. Leaf blades mostly involute, variable in length, to 15 cm long, mostly about 1 mm wide (folded). Panicles terminal and axillary, slender, rather compact, the branches closely appressed-ascending, 2–10 cm long. Spikelets lanceolate, 2 mm long or slightly longer, frequently but not always in any given panicle with 1–3 long hairs arising just below the spikelet; first glume ovate, obtuse apically, slightly over half the length of the spikelet, 1-nerved, nerve sometimes obscure; second glume equalling or a bit longer than the similar sterile lemma, acute to acuminate apically, 3–5-nerved, green or partially purple.

Depressions in pine savannas and flatwoods, bogs, pine-cypress flats, cypress-gum ponds, margins of ponds, lakes, marshes. Coastal plain, N.C. to s. Fla., w. to e. and s.e. Tex.

5. **Panicum anceps** Michx.

Perennial with conspicuous scaly rhizomes, not clump-forming. Stems 6–10 dm tall, internodes glabrous or pilose just above the nodes. Leaf sheaths glabrous or pubescent, blades 3–6 dm long, 4–12 (–15) mm wide, elongate, finely scabrous on the margins and sometimes with scattered longer hairs, sometimes pubescent on one or both surfaces. Panicles very variable in overall size and manner of branching, relatively open and diffuse, the branches distant, spikelets disposed irregularly and not closely on the branchlets, varying to relatively condensed, the branchlets relatively short and heavily floriferous. Spikelets extending straight from the stalks, or obliquely from them, even on the same branchlet, mostly the latter, lance-elliptic but soon gaping distally, 2–4 mm long; first glume ⅓–½ the length of the spikelet, surrounding much of the base of the spikelet, obtuse apically, 3-nerved; second glume and sterile lemma equal, giving the length of the spikelet, strongly 5–7-nerved, apically acuminate. (Incl. *P. rhizomatum* Hitchc. & Chase)

Tolerant of a wide range of moisture conditions from well-drained to water-logged; upland pine-hardwood stands of various mixtures, pine savannas and flatwoods, old fields, hammocks, cypress-gum ponds (especially during drought periods), swamps. N.J. to s. Ohio and s. Ill., Mo. and Kans., generally southward to s. Fla. and Tex.

6. **Panicum hemitomon** Schult. MAIDENCANE. Fig. 78

Aquatic or subaquatic, perennial with extensive rhizomes, forming very extensive almost pure stands. In deeper water, feathery roots occur on the submersed nodes. Stems 5–20 (–25) dm tall, glabrous. Leaf sheaths glabrous to strongly pilose, blades 10–25 cm long and 5–15 mm wide, truncate or slightly narrowed basally, long-tapering distally, marginally scabrous. Panicle narrow, 10–20 cm long, the spikelets in very short fascicles on the main axis or singly or in short fascicles on appressed-ascending branches, the lower branches distant, the upper shorter and close or reduced to fascicles which are close-set. Spikelets lance-ovate, 2 mm long or a little longer; first glume ⅓ - ½

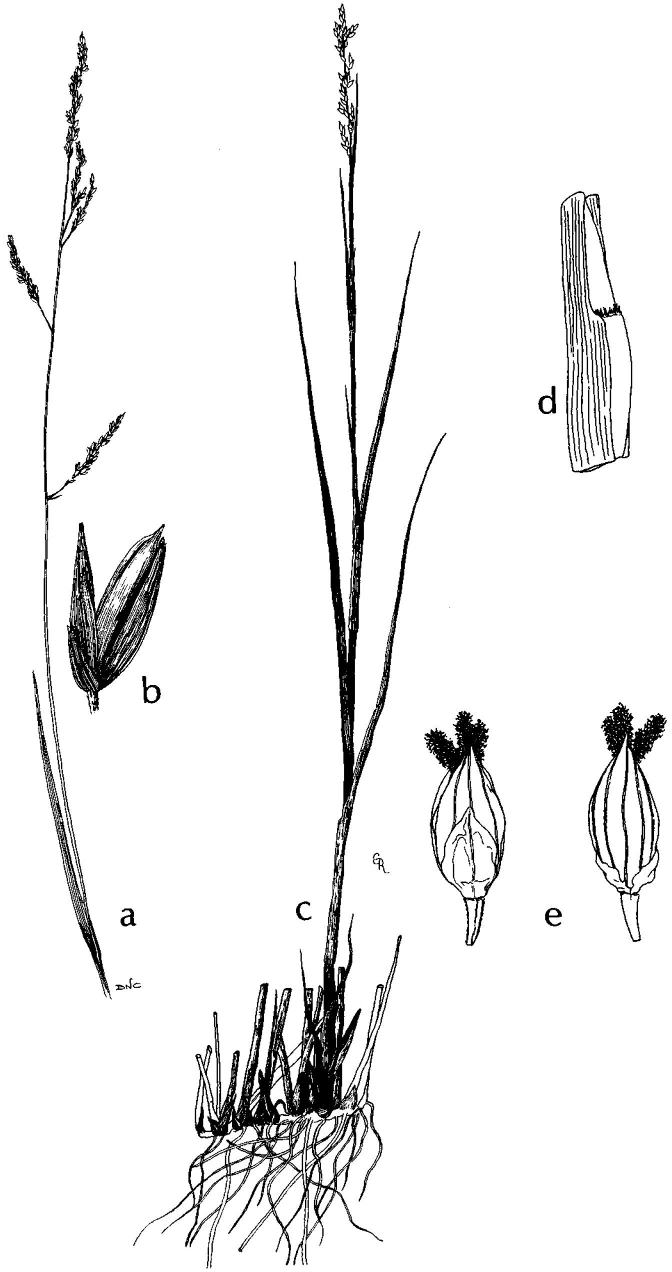

Fig. 77. a–b, **Panicum hians:** a, panicle; b, spikelet; c–e, **Panicum tenerum:** c, habit; d, ligule; e, spikelet (two views).

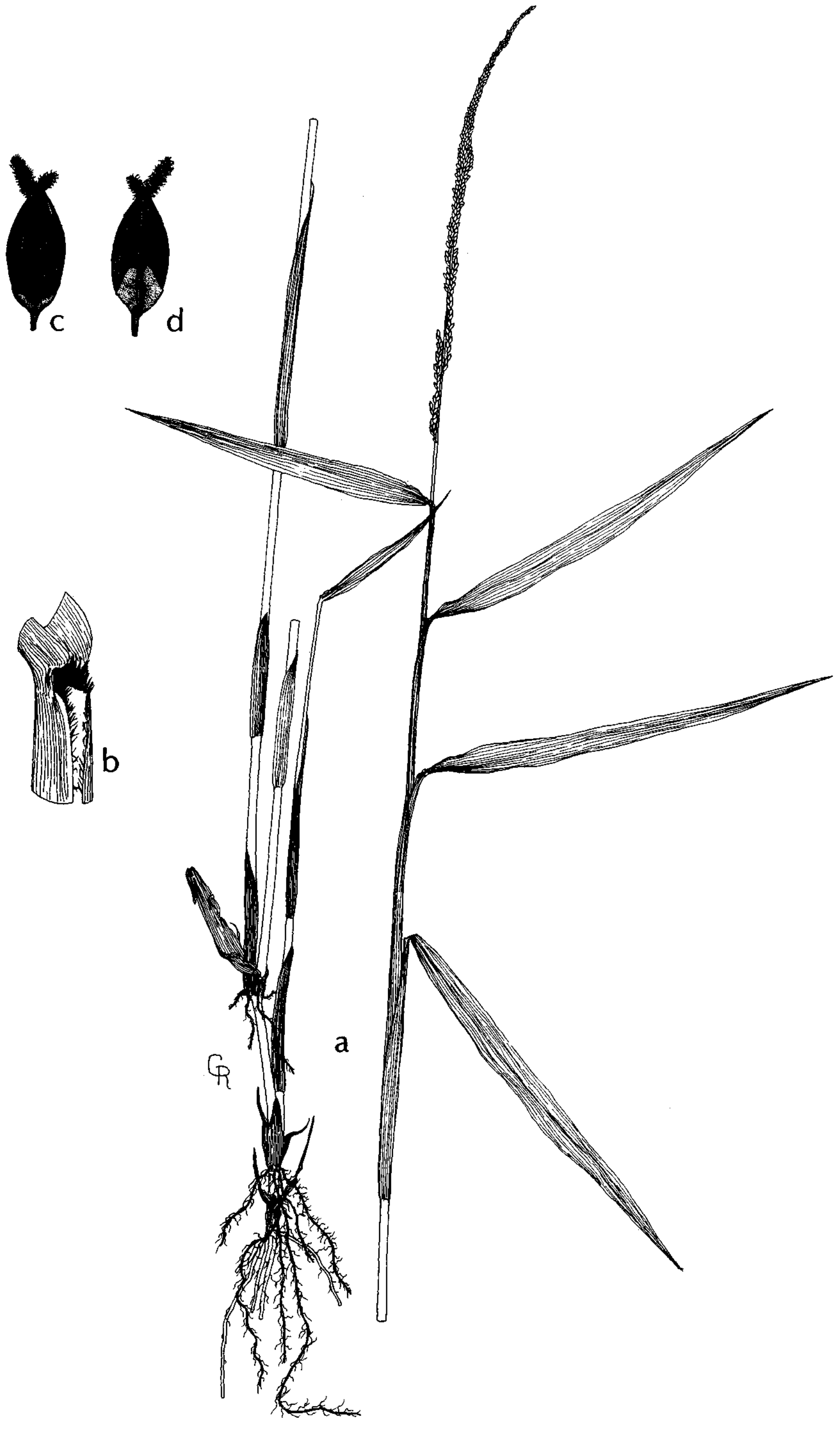

Fig. 78. **Panicum hemitomon:** a, habit; b, ligule; c–d, spikelet (two views).

the length of the spikelet, ovate-acuminate, slightly keeled on the back, two lateral nerves obscure; second glume strongly 3-nerved, acute, very slightly shorter than the similar sterile lemma.

In almost pure stands in many shallow lakes and ponds, often in water 2 m deep or more, marshy shores, ditches and drainage canals, cypress-gum ponds. Coastal plain, N.J. to s. Fla.; w. to e. and s.e. Tex.; also Tenn.; S.Am.

7. Panicum virgatum L. SWITCHGRASS. Fig. 79

Perennial with vigorous short or long rhizomes forming ascending shoots terminally and resulting in small to large clumps. Stems mostly 1–2 m tall, glabrous, green or glaucous. Leaf sheaths glabrous, blades flat, green or glaucous, 1–6 dm long and mostly 5–15 mm wide, scabrous marginally, often pilose on the upper surface near the base, rarely pilose distally. Panicle terminal, the branches thin-wiry, sometimes very long and strongly ascending, usually diverging-ascending, overall variable in size, the larger 3–5 dm long. Spikelets disposed on the upper halves of the branchlets or only distally, from about 3–5 mm long, ovoid-elliptic at first, soon widening distally as the glume and sterile lemma spread; glumes variable in shape and length, especially the first; first glume half as long to nearly as long as the spikelet, basally nearly surrounding the spikelet, apically acuminate (shorter ones sometimes acute or obtuse), midrib somewhat keeled, often scabrid at the tip, 3-nerved; second glume equalling or somewhat exceeding the similar sterile lemma, usually 7-nerved, acuminate apically.

Fresh or brackish marshes, seasonally wet pinelands, prairies, shores of rivers, ponds, lakes, estuaries, mostly above high water mark but sometimes in shallow water. N.S. and Que. to Man. and Mont., s. to s. Fla., Tex.; Nev. and Ariz.; Cuba.

8. Panicum gymnocarpon Ell. Fig. 80

Rather coarse annual. Lower stems long-decumbent, rooting at the nodes, markedly geniculate, having essentially a sprawling habit, the flowering stems ascending, leafy to the inflorescence, a wide band at the nodes, this commonly dark olive green; nodes and internodes glabrous. Leaf blades elongate, broadest at the truncate to subcordate base, long-tapering above the middle, of various widths, the larger about 2 cm wide or a little wider, smooth or scabrous on the margins. Panicle distinctive: open, more or less pyramidal, with a stiff straight central axis; from most rather remote nodes arises a whorl of secondaries, an opposite, relatively elongate, pair bearing spikelets singly or in fascicles and 1–several much shorter ones; panicles vary greatly in size from about 1 dm long and 4–5 cm wide to 4 dm long and 1.5 dm wide. Spikelets stalked, they or the fascicles appressed to the axis and mostly secund on the lower side, lanceolate-acuminate, mostly 5–7 mm long; first glume about as long as the sterile lemma, strongly 3-nerved, the midnerve keeled, scabrous, subulate or long-acuminate apically; second glume longer than the sterile lemma thus giving the length of the spikelet, strongly 3–5-nerved, the midnerve keeled and scabrous, apically acuminate; sterile lemma thin, much like the glumes.

Often in shallow water, usually rooted in soft mud; swamps, wet woodlands, sluggish streams, oxbows of floodplain forests, sloughs, ditches, marshy shores of lakes, ponds, streams, both in the open and in relatively dense shade. Coastal plain, N.C. to n. Fla., w. to e. and s.e. Tex., Ark.

9. Panicum dichotomiflorum Michx. FALL PANIC GRASS. Fig. 81

Relatively coarse annual. Stems commonly with several thick, leafy spreading branches from the base and branched above as well, sometimes simple; lower stems often decumbent, geniculate, rooting at the nodes; in water the lower stems, even if erect, profusely rooting at the submersed nodes; simple stems or arched-ascending branches of branched ones to 1–2 m long, glabrous. Leaf sheaths loose, glabrous, blades flat, 1–5 dm long, 0.5–2 cm wide, finely scabrous marginally, often pubescent on the upper surfaces. Panicles terminal on the main stem or the principal branches, the latter frequently not

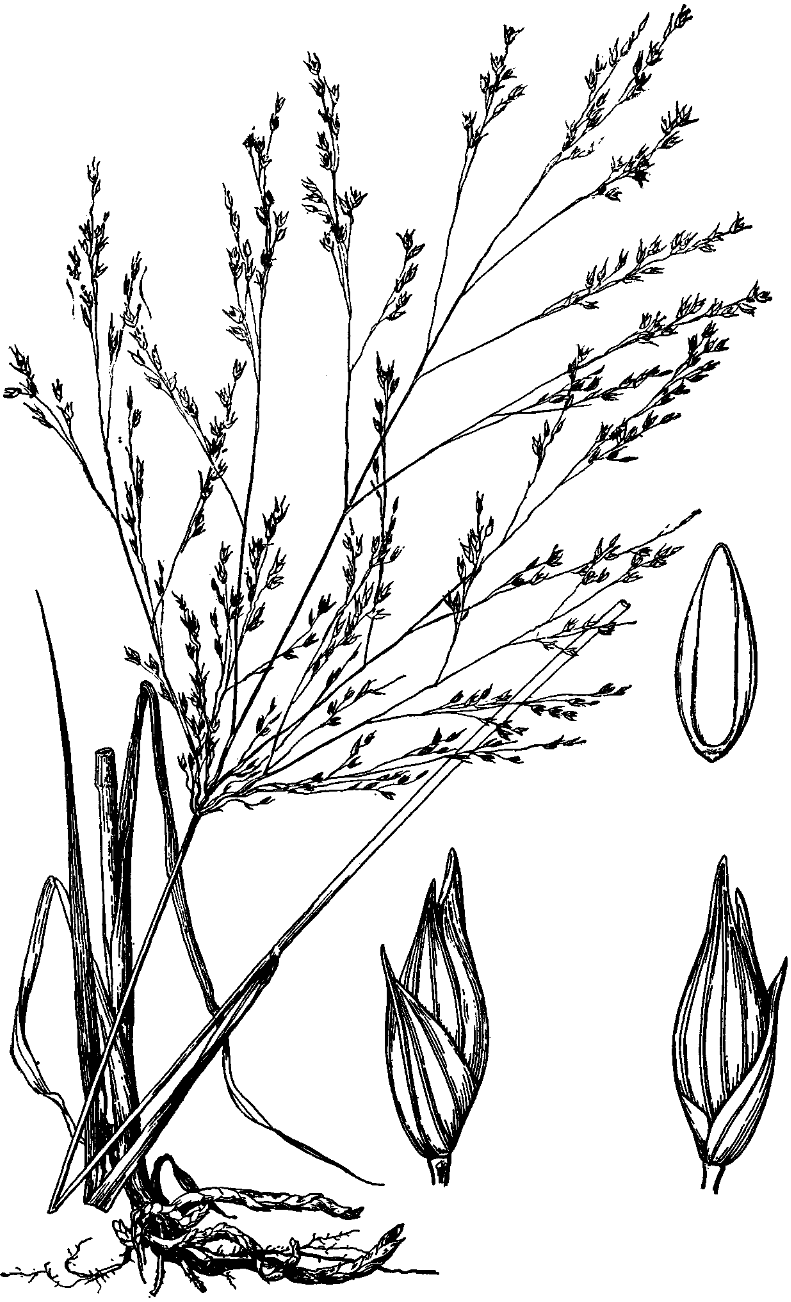

Fig. 79. **Panicum virgatum:** habit, spikelet (two views) and floret. (From Hitchcock and Chase)

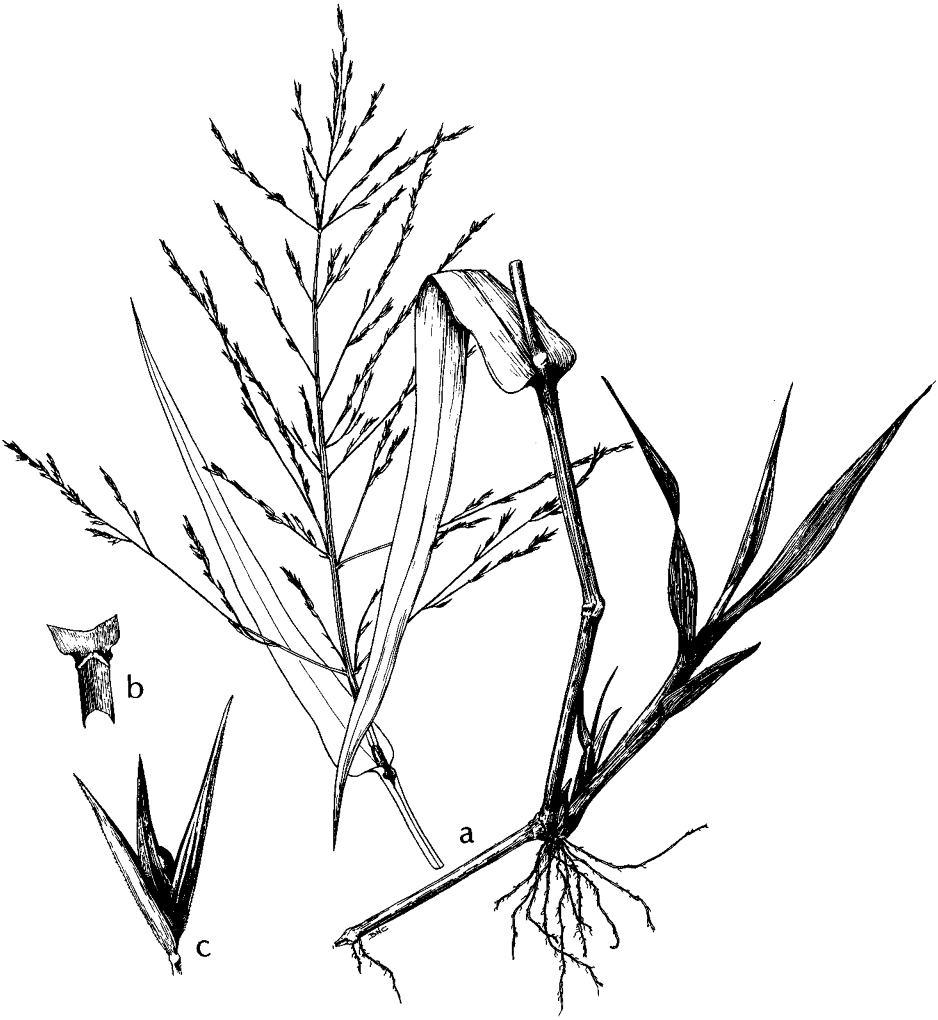

Fig. 80. **Panicum gymnocarpum:** a, habit; b, ligule; c, spikelet.

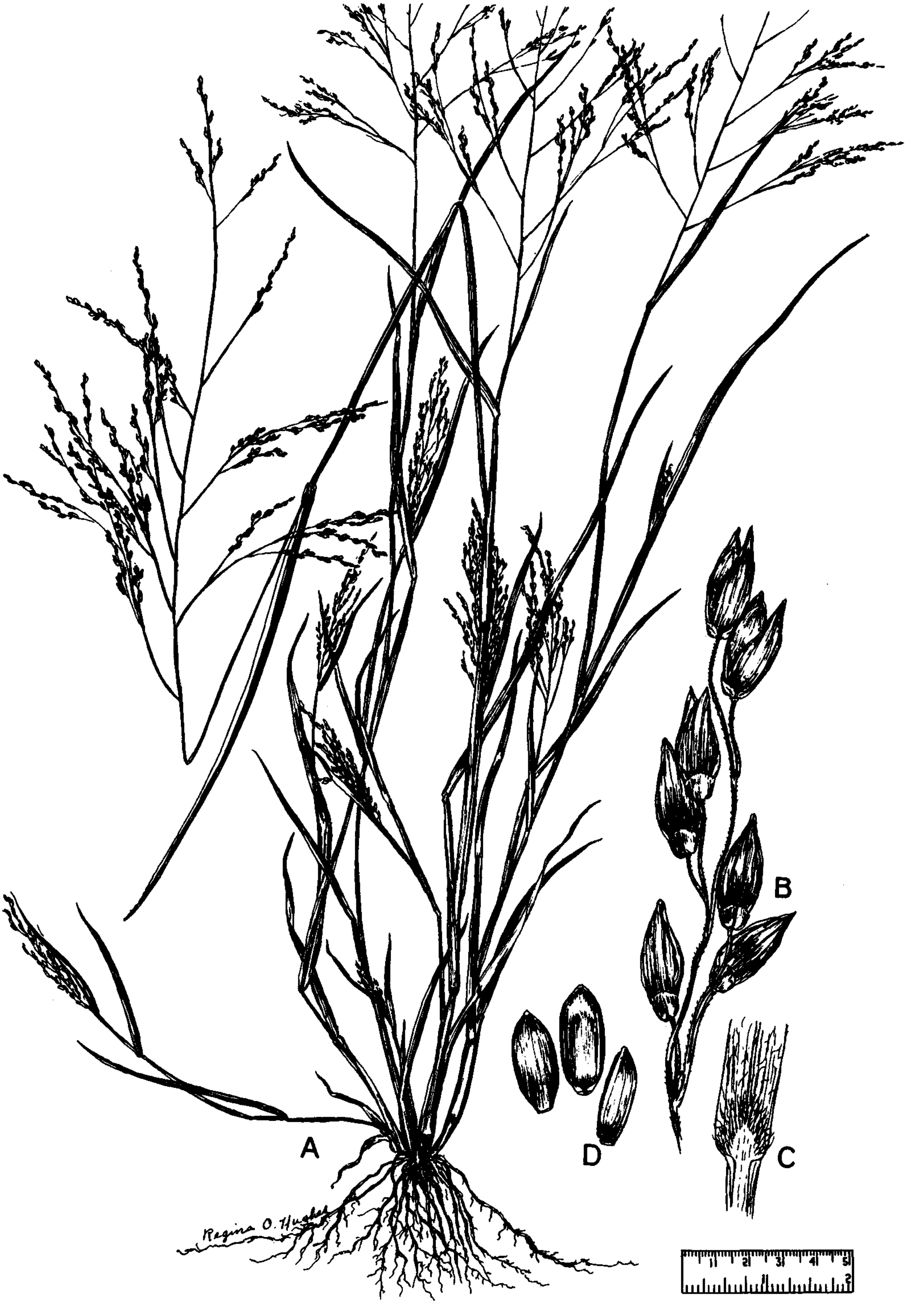
A
B
C
D
Regina O. Hughes
1
2
3
4
5
1
2

Fig. 81. **Panicum dichotomiflorum:** A, habit; B, portion of panicle; C, ligule; D, grains. (From Reed, *Selected Weeds of the United States* (1970) Fig. 35)

wholly exserted from the sheaths, very variable in overall size, open and generally diffuse, the spreading branches filiform or capillary. Spikelets borne not densely on the ultimate branchlets, appressed-ascending, lance-elliptic, acute apically, 2.5–3 mm long; first glume short, nearly surrounding the base of the spikelet, short-broadly obtuse to rounded apically, nerves obscure; second glume and sterile lemma equal, giving the length of the spikelet, apically acute, 7-nerved, green, or partially or wholly purple.

Marshy shores exposed at times of low water, on alluvium in floodplain forests, spoil banks, temporary pools, moist to wet clearings, often in shallow water. N.S. and Maine to Minn. generally southward to s. Fla., and Tex., occasionally introduced westward; W.I.

Plants appearing to us essentially like *P. dichotomiflorum* but with pustular-based, long-spreading hairs on the leaf sheaths are referred to *P. bartowense* Scribn. These occur in Florida and the West Indies, perhaps are not specifically distinct from *P. dichotomoflorum.*

10. Panicum hians Ell. Fig. 77

Slender tufted perennial. Stems occasionally shortly decumbent below, i.e., for 2–3 nodes, mostly usually erect, (1–) 3–6 dm tall, glabrous. Leaf blades flat, variable in length, 5–15 cm long, 1.5 mm wide, rarely a little wider, linear-attenuate. Panicles delicate, open, the branches spreading, sometimes drooping, few and distant, filiform or capillary, naked basally or floriferous to the base. Spikelets mostly on short fascicles from the secondary branches, lance-elliptic (unopened), about 2 mm long, the glumes and sterile lemma commonly partially or wholly purple at maturity; first glume half the length of the spikelet, ovate, apically obtuse to rounded, 3–nerved; second glume nearly equalling the similar sterile lemma, 3–5-nerved, acute or short-acuminate.

Marshy and exposed shores of streams, ponds, lakes, depressions in pine savannas and flatwoods, cypress-gum ponds, open floodplain woods, seepage areas, ditches. Coastal plain, Va. to s. Fla., w. to Tex., Ark., Okla., Mo.; Mex.

11. Panicum rigidulum Nees. Fig. 82

Clumped perennial, forming short-leaved offshoots from coarse hard bases. Stems 5–12 dm tall, glabrous. Leaf sheaths loose, strongly flattened, usually glabrous, occasionally pubescent, blades folded basally, flat distally, variable in length, 2–5 dm long, 5–12 mm wide, finely scabrous marginally, surfaces usually glabrous, occasionally pubescent; ligule a scarious membrane, often coarsely to finely lacerated distally. Panicle open, the branches spreading widely, the branchlets not heavily floriferous, varying to relatively condensed, the branchlets strongly ascending and heavily floriferous. Spikelets lanceolate, pointed, mostly 2–3 mm long; first glume clasping basally, ovate, 3–nerved, somewhat keeled, acute to acuminate apically, ½–⅔ the length of the spikelet, the midnerve scabrous at least distally; second glume and sterile lemma subequal, giving the length of the spikelet, with 3 strong nerves and an additional weaker one near either margin, the midnerve smooth or slightly scabrous, apically acuminate; both glumes and sterile lemma green varying to fully purple. (*P. agrostoides* Spreng.; incl. *P. stipitatum* Nash, *P. condensum* Nash)

Commonly locally very abundant in wet places, wet woodlands, swamps, floodplain forests, river bars and shores exposed at low water, wet meadows, marshy shores of ponds, lakes, interdune swales, depressions in pine flatwoods, drainage ditches and canals. Maine to Mich., Ill., Iowa, generally southward to s. Fla., e. and s.e. Tex.

12. Panicum longifolium Torr. Fig. 82

Similar in general aspect to *P. rigidulum,* generally more slender, the hardened bases sometimes somewhat elongate, thickish and subrhizomatous, older portions bearing old leaf bases. Leaf sheaths and blades narrower, the blades scarcely if at all wider than the sheaths, 2–5 (–7) mm wide, often involute distally as well as basally; ligule a fringe of cilia. Spikelets 2–3 mm long or a little longer.

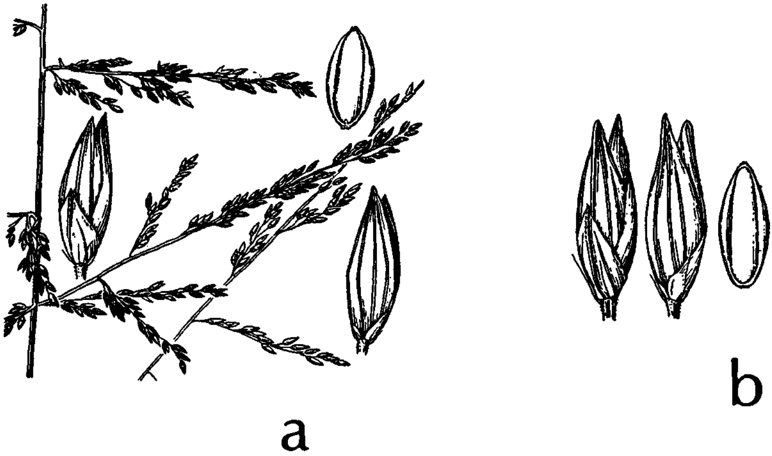

Fig. 82. a, **Panicum rigidulum:** portion of panicle, spikelet (two views) and floret; b, **Panicum longifolium:** spikelet (two views) and floret. (From Hitchcock and Chase)

Often in shallow water, sinkhole ponds, depressions of pine flatwoods, bogs, shrub bogs, hillside seepage bogs, margins of cypress-gum ponds, swales. N.S., e. Mass. to Fla., w. to e. Tex.; Tenn., Ky., s. Ind.

13. Panicum spretum Schult. Fig. 83

Stems tufted, glabrous or pubescent. Leaf blades 3–8 cm long, 3–8 mm wide, sheaths or blades glabrous or pubescent; a ligulelike ring of hairs 2–3 mm long at base of blade. Vernal panicle terminal, open, ovate or oval in overall outline, mostly 3–4 cm long. Spikelets 1.0–1.5 mm long, glabrous or pubescent, elliptic, oval or obovate; second glume and sterile lemma weakly nerved. Autumnal phase more or less fasciculate-branched, the leaves smaller, panicles with few spikelets, scarcely exserted from the sheaths. (Incl. *P. leucothrix* Nash, *P. lindheimeri* Nash, *P. longiligulatum* Nash, *P. wrightianum* Scribn.)

Meadows, wet woodlands, exposed margins and bottoms of ponds, lakes, pine savannas and flatwoods, exposed bottoms of cypress-gum ponds and depressions, mesic woods, oak-pine woods. Que. and Maine to Minn., generally southward to n. Fla. and N.Mex.; Calif.

14. Panicum polyanthes Schult. Fig. 83

Stems solitary or a few in a tuft, mostly 6–10 dm tall, sometimes shorter, glabrous. Leaf sheaths glabrous, blades glabrous except for a few cilia basally, very finely scabrid marginally; larger blades mostly 10–15 cm long, 15–30 mm wide, uppermost little smaller than those at midstem, cordate-clasping at the base; ligule essentially none. Vernal panicle terminal, open, mostly about twice as long as broad, 8–15 cm long, nearly oval in overall outline. Spikelets broadly elliptic to obovate, from just over 1 mm to 1.5 mm long; first glume ovate, almost hyaline, obtuse or acute apically; second glume and similar sterile lemma strongly nerved, nearly equal, glabrous or short-pubescent. Autumnal phase similar or with a few short branches from lower nodes.

Moist sandy, open woodlands, borders of wet woodlands, moist clearings, ditches. From Conn. in a generally southwesterly direction to Okla., generally southward to Ga., w. to e. Tex.

15. Panicum erectifolium Nash. Fig. 83

Somewhat similar to *P. polyanthes* (and to *P. sphaerocarpon* which mostly inhabits well-drained sites) but more tufted, of lower stature, with smaller leaves. Stems 3–5 dm tall, glabrous. Leaf sheaths ciliate marginally, the larger blades 3–8 cm long and 5–10 mm wide, mostly cordate-clasping at the base, with tuberculate-based hairs marginally near the base, occasionally also surficially, the margins otherwise smooth or barely scabrid; ligule a ring of very short hairs. Vernal panicles terminal, open, oval in overall outline, 4–10 cm long. Spikelets 1 mm long or just over, oval-elliptic; first glume scarious, very short, abruptly short-pointed apically; second glume and sterile lemma short-pubescent or glabrous, strongly nerved. Autumnal phase branching freely from the lower nodes, the branches erect, about equally long.

Pine savannas and flatwoods, interdune swales, pond pine-evergreen shrub bogs, cypress-gum depressions or ponds, exposed margins of ponds, sometimes in shallow water. Coastal plain, N.C. to Fla., w. to La.; Cuba.

16. Panicum scabriusculum Ell. Fig. 83

Stems few in a tuft (basal rosettes often rotted off by the time the flowering stems are fully developed), 8–12 dm tall, internodes usually glabrous, sometimes pubescent. Leaf sheaths glabrous or pubescent, blades broadest somewhat above the base then gradually tapering to an involute tip, the larger 8–15 cm long, 6–12 mm wide, very finely scabrous marginally, surfaces glabrous or somewhat pubescent; ligule membranous, to 1 mm long. Vernal panicle open, relatively diffuse, ovate in overall outline, 8–15 (–20) cm long. Spikelets ovate or lance-ovate, green to purple, 2–2.5 mm long, glabrous or minutely short-pubescent; first glume about as broad as long, $\frac{1}{6}$–$\frac{1}{3}$ the length of the spikelet,

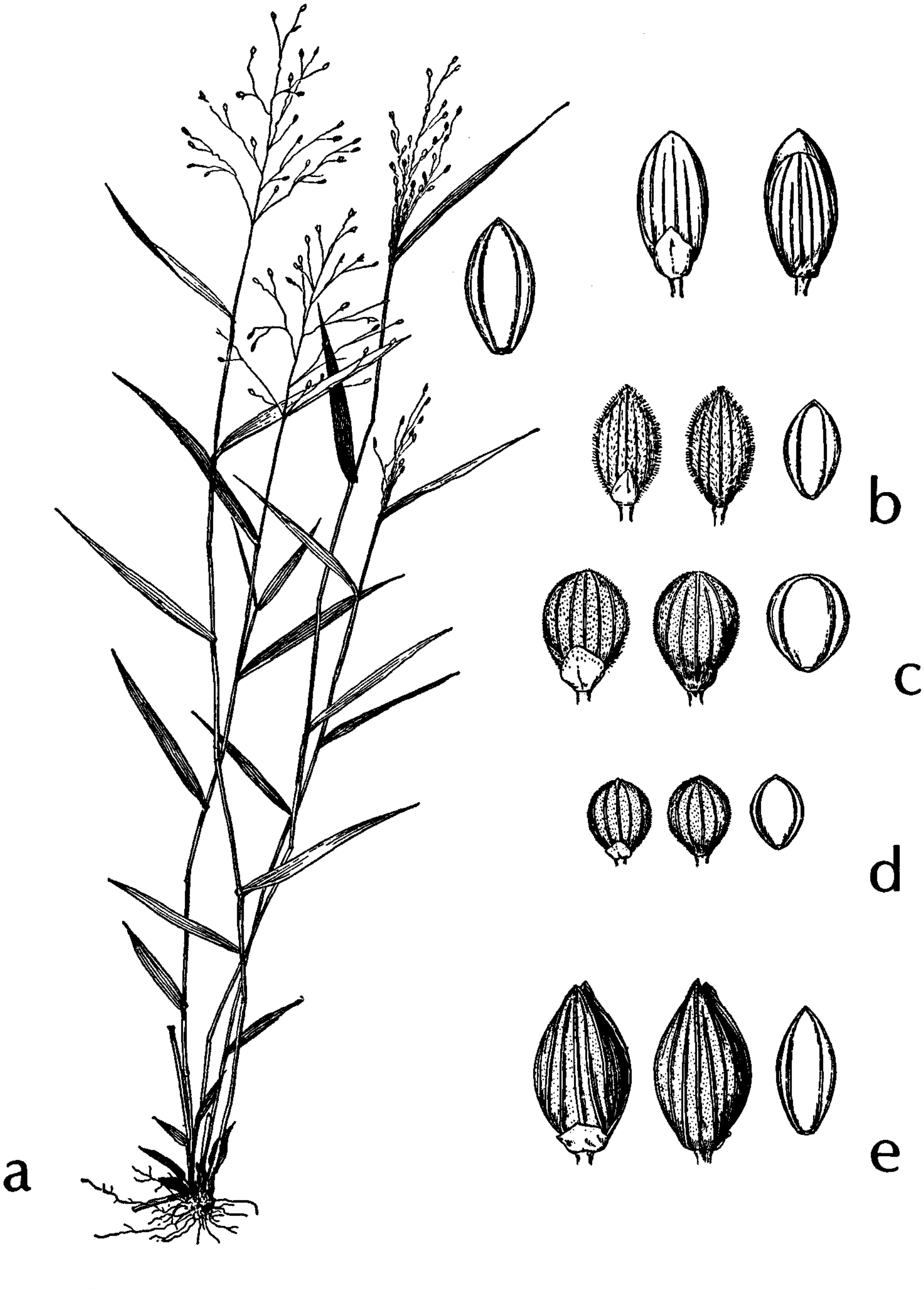

Fig. 83. a, **Panicum dichotomum:** habit, spikelet (two views) and floret; b–e, spikelet (two views) and floret of: b, **Panicum spretum:** c, **Panicum polyanthes:** d, **Panicum erectifolium:** e, **Panicum scabriusculum.** (From Hitchcock and Chase)

apically almost truncate, obtuse or acute; second glume and similar sterile lemma about equal or the glume slightly longer, strongly nerved, pointed apically. Autumnal phase with short fascicled branches from middle and upper nodes, the blades much reduced in size, the panicles partially included in the sheaths. (Incl. *P. cryptanthum* Ashe)

Commonly in shallow water, in mucky substrate, swamps, wet woodlands, pine savannas and flatwoods depressions, cypress-gum ponds, bogs, marshy stream banks, shores of ponds, lakes, ditches. Coastal plain, s. N.J. to n. Fla.; w. to Tex.

17. Panicum scoparium Lam. Fig. 84

Stems solitary or few in a tuft, 8–12 dm tall, densely soft-velvety-pubescent except for a broad ring just below the node. Leaf sheaths long-hairy below, glabrous but viscid toward the summit, blades broadest above the base then tapering to an involute tip, the larger 10–20 cm long, 10–20 mm wide, softly pubescent on both surfaces, marginally finely scabrous and sometimes with tuberculate-based long stiff hairs; ligule a dense ring of hairs 1.5–3 mm long. Vernal panicle ovate to oval in overall outline, 8–15 cm long or a little more. Spikelets green or sometimes somewhat purplish, obovate, softly pubescent, 2–2.5 mm long or a little more; first glume ¼ the length of the spikelet or less, ovate, apically acute or acuminate (often both in the same panicle); second glume somewhat shorter than to nearly equalling the similar sterile lemma, strongly nerved. Autumnal phase copiously fasciculately branched and rebranched from middle and upper nodes, the leaf blades small, sheaths of the uppermost pubescent throughout, panicles small, few-flowered, scarcely extruded from the sheaths.

Wet sandy soils, alluvial outwash, clearings, pond margins, swales, marshy borders of swamps and wet woodlands, ditches. Mass. to N.C., Ky., and Mo.; generally southward to Fla., Okla., e. and s.e. Tex.

18. Panicum dichotomum L. Fig. 83

Stems tufted from a usually knotty crown, relatively slender, erect or ascending, 4–10 dm tall, glabrous or retrorsely bearded around the nodes. Leaf sheaths essentially glabrous, the blades thin, spreading, the upper commonly reflexed, 3–12 cm long, 4–15 mm wide, glabrous or pubescent at base; ligule, if present, a ring of hairs about 1 mm long. Vernal panicle oval or ovate in overall outline, open, usually with many spikelets. Spikelets 1.5–2.0 mm long or a little longer, elliptic, glabrous or pubescent; first glume triangular-ovate, apically obtuse, acute, or acuminate (even in the same panicle), glabrous, ¼ – ⅓ the length of the spikelet; second glume usually shorter than the similar sterile lemma, sometimes equal, blunt at the tip, glabrous or short-pubescent. Autumnal phase with "bushy" branches, leaves much reduced, often reclining because of the heavy weight of the top, the panicles with few spikelets. (Incl. *P. annulum* Ashe, *P. barbulatum* Michx., *P. caerulescens* Hack., *P. lucidum* Ashe, *P. microcarpon* Muhl, ex Ell., *P. nitidum* Lam., *P. sphagnicolum* Ashe, *P. roanokense* Ashe, *P. yadkinense* Ashe)

Meadows, sphagnous bogs, wooded stream banks and seepage areas, bottomland woodlands, open oak-pine woodlands, wet clearings, swales, ditches. N.B. to Mich., Ill., generally southward to Fla. and Tex.

We admit that our failure to distinguish the several named taxa in synonymy above was born of despair!

19. Panicum strigosum Muhl.

Densely tufted perennial, often cushiony. Stems 1–4 dm tall, sparsely to densely long pubescent (sometimes glabrate). Leaf sheaths pilose to almost glabrous, both leaf surfaces usually pilose, 3–8 cm long, 6–10 mm wide; ligule a ring of hairs 1–2.5 mm long. Vernal panicles open, 5–7 cm long, the axes bearing long hairs. Spikelets obovate or broadly elliptic, 1–1.5 mm long, glabrous; first glume ⅓ the length of the spikelet or a little more, clasping basally, obtuse apically, second glume and sterile lemma about equal, blunt, weakly nerved. Autumnal phase similar but panicles usually more or less concealed amongst basal leaves. (Incl. *P. polycaulon* Nash)

Pine savannas and flatwoods, bogs, wet sands and sandy peats. Va., N.C., Tenn., to Fla. and Tex.

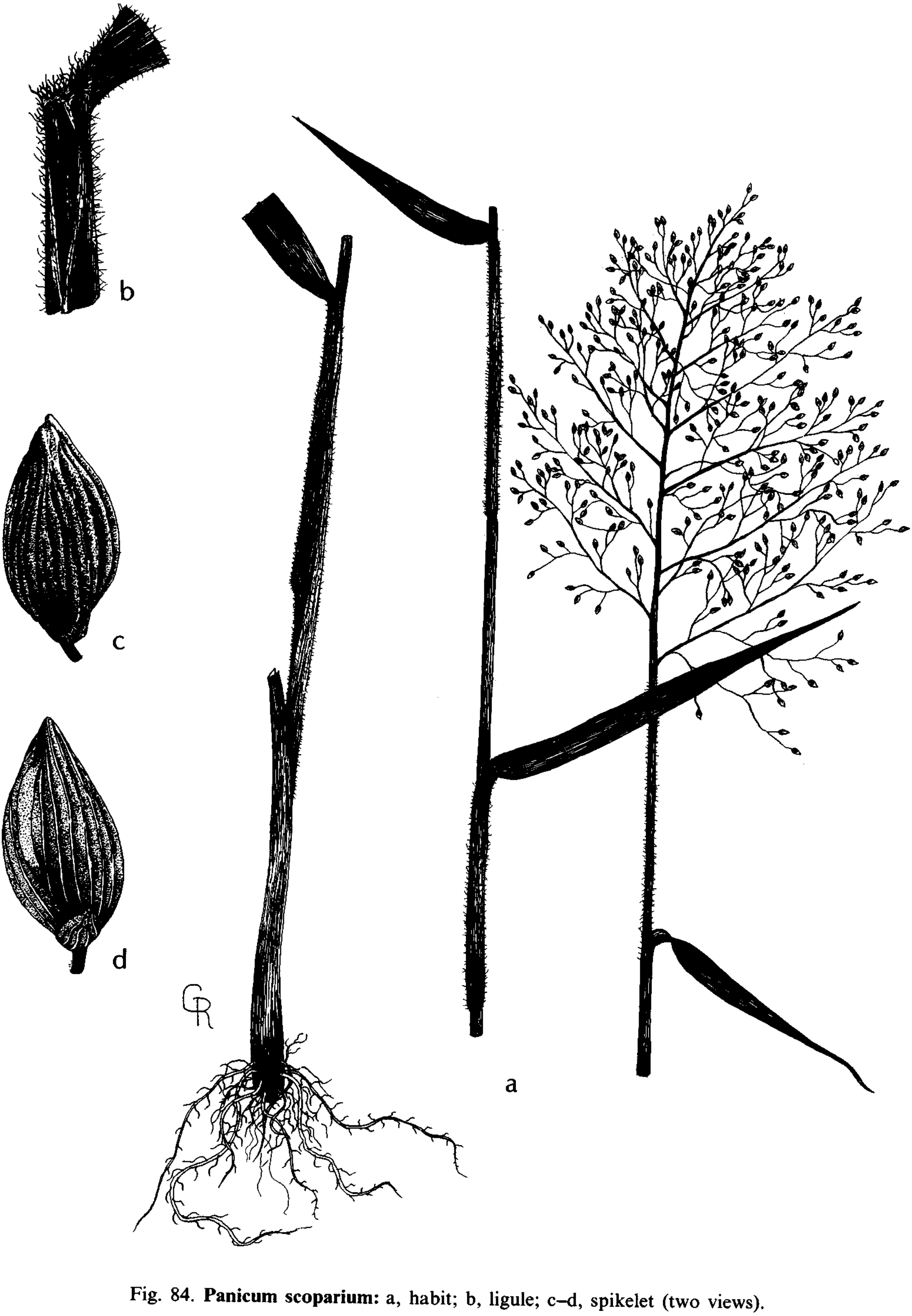

Fig. 84. **Panicum scoparium:** a, habit; b, ligule; c–d, spikelet (two views).

20. Panicum chamaelonche Trin.

Perennial, densely tufted, often more or less purplish. Stems 1–3 dm tall, glabrous or the nodes pubescent. Leaf sheaths ciliate marginally, especially near the summit, blades to 4 cm long, 1–2.5 mm wide, sometimes marginally ciliate near the base; ligule a ring of short hairs. Vernal panicle open, ovate to oval in overall outline, 2–5 cm long, 1.5–4 cm broad. Spikelets elliptic to obovate, about 1 mm long; first glume small, ovate, apically rounded, obtuse, or acute; second glume and sterile lemma weakly nerved, obtuse or abruptly apiculate apically. Autumnal phase very densely short-branched and thus cushiony, panicles smaller, just exserted or partially exserted from the sheaths.

Pine savannas and flatwoods, often extremely abundant where soils mechanically disturbed. Coastal plain, N.C. to Fla., and La.; Cuba.

21. Panicum ensifolium Baldw. ex Ell.

Tufted perennial. Stems 2–4 dm tall, slender, usually glabrous, erect or lax-leaning. Leaf sheaths usually glabrous, blades 1–4 cm long, 1.5–4 mm wide, often minutely pubescent below, scarcely if at all with a whitish cartilaginous bandlike margin; ligule a ring of short hairs. Vernal panicle open, 2–6 cm long, ovate to oval in overall outline. Spikelets elliptic, glabrous or short-pubescent, 1.3–1.5 mm long; first glume small, about ⅓ the length of the spikelet, obtuse to acute apically; second glume and sterile lemma usually a little shorter than the "fruit." Autumnal phase copiously branched, with both terminal and axillary panicles bearing few spikelets.

Pine savannas and flatwoods, bogs. Coastal plain, s. N.J. to Fla. and La.

22. Echinochloa (WATER GRASSES)

Annuals (ours). Leaves with compressed sheaths and long flat blades. Ligule not present (in ours). Inflorescence with one principal central axis, this bearing spikelike lateral floriferous branches. Spikelets subsessile or short-stalked, solitary on the secondary laterals or congested on short branches of the laterals. Spikelets somewhat plano-convex though not markedly so; glumes unequal, the first a third to half the length of the spikelet, 3-nerved, ovate, apically obtuse to cuspidate, not awned; second glume and sterile lemma about equal, as long as the spikelet, commonly both awned, the awn of the glume shorter than that of the lemma, or the glume awnless, the lemma awned, or both awnless, acuminate, mucronate, or cuspidate. Fertile lemma thin-cartilaginous, blunt to acuminate, the margins inrolled over the somewhat thinner palea, tip of the palea not enclosed.

A weedy group of plants. As is generally the case with annuals, highly variable in stature. Variable as well in respect to combinations of diagnostic characters thus authors delimit the component taxa very differently. The treatment below may be oversimplified. We give no synonymy because our understanding of the taxonomic-nomenclatural complexities is too meagre to permit our doing so.

1. Spikelets borne singly from the axes of the spikelike branches, compacted into about 4 rows on one side. 1. *E. colonum*
1. Spikelets borne on short clusterlike branches from the axes of the spikelike laterals.
  2. Spikelets ovate, about twice as long as broad; awns of the sterile lemmas if present usually not exceeding 1 cm in length. 2. *E. crusgalli*
  2. Spikelets lanceolate, about three times as long as broad; conspicuous awns usually present on the sterile lemmas, from 1.0–2.5 cm long. 3. *E. walteri*

1. Enchinochloa colonum (L.) Link. JUNGLE RICE. Fig. 85

Plant commonly with several-numerous stems from the base, these erect or decumbent below and sometimes rooting at the nodes, the flowering stems ascending-erect, 1.5–6 dm tall or a little taller. Leaf blades 3–6 mm wide, sheaths and blades glabrous. Spikelike floriferous branches erect-ascending or diverging, usually not exceeding 2.5–3.0 cm long, often 1–2 cm apart, not or only partially overlapping. Spikelets borne

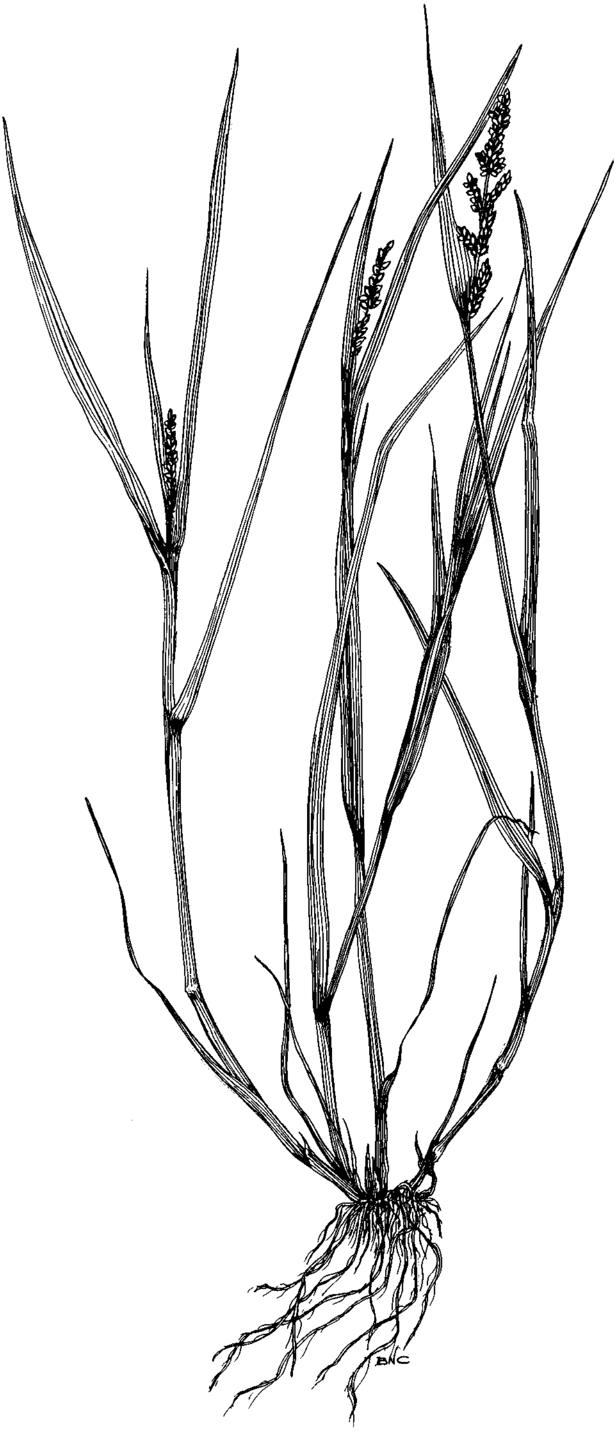

Fig. 85. **Echinochloa colonum:** habit.

singly on the axis, rather compactly in about 4 rows; ovate, awnless, mostly 2.5–3.0 mm long, apically short-acuminate, hispid on the nerves, green to purple.

Weedy, generally in moist to wet open places, cultivated fields, ditches, exposed shores, sand and gravel bars, areas of soil disturbance. Pa. to Mo., generally southward to Fla. and Tex.; Calif. Native in Old World tropics. Widely naturalized in warm regions of New World.

2. **Echinochloa crusgalli** (L.) Beauv. BARNYARD GRASS. Fig. 86

Stems simple or several from the base, of variable stature, to 1 m tall or somewhat taller, often coarse. Leaf sheaths and blades glabrous, the blades 0.8–2.5 cm wide, usually finely scabrid marginally. Spikelike floriferous branches ascending or sometimes nodding, much overlapping, the longest below, gradually diminishing in length upward to a spikelike tip; spikelets congested on short clusterlike branches of the main laterals; ovoid, about twice as long as broad, about 3 mm long, acuminate apically and awnless or second glume and sterile lemma awned, the awns very variable in length, hispid on the nerves, the trichomes nonpustular-based or some or all pustular-based, green to purple.

Weedy, usually in moist to wet grounds, cultivated fields, marshes, seepage areas, shores, ditches and drainage canals, waste places. Native in the Old World, very widely naturalized.

3. **Echinochloa walteri** (Pursh) Heller.

Plant with one–several usually erect stems from the base, variable in stature, 8–20 dm tall, commonly much taller than the preceding. Leaf sheaths, at least the lower, wholly or partially clothed with long pustular-based hairs (the hairs often deciduous leaving the pustular bases), or wholly glabrous; blades glabrous but harshly scabrid marginally, 0.5–3 cm wide. Spikelike lateral branches of the inflorescence much overlapping, the lower longest, gradually diminishing in length upward to a spikelike tip; the whole inflorescence and its branches commonly nodding or arching. Spikelets congested on short branches of the secondary laterals; lanceolate or elliptic, 3.0–4.0 mm long, excluding the awns; second glume and sterile lemma awned (very rarely only mucronate), the awn of the glume short, that of the lemma variable in length to 3.5 cm long; hispid on the nerves, the trichomes not pustular-based.

Often in shallow water, marshes, borders of swamps, drainage and irrigation ditches and canals, ponds. Mass. to Wis., generally southward to Fla. and Tex.

23. Sacciolepis

Sacciolepis striata (L.) Nash. Fig. 87

Aquatic or semiaquatic perennial with creeping stolons and decumbent stems rooting at the nodes, weak, usually branching vertical stems a meter or more long arising from these; commonly forming dense local stands. Stems and leaf blades glabrous, only the margins of the leaf sheaths hirsute, or more rarely the whole surface of some or all of the leaf sheaths hirsute. Leaf sheaths and blades striate, the blades flat, mostly tapering from the base, 4–20 cm long and 3–20 mm wide; ligule a short membranous collar usually bearing hairs 1–3 mm long from near its summit. Spikelets 3.5–5 mm long on pedicels of unequal length, borne rather loosely or fairly compactly on solitary, elongate, almost cylindrical panicles mostly 6–20 cm long; spikelets asymmetrical owing to the inflated saclike base of the second glume, lanceolate as viewed from the side of this glume, oblong or lance-oblong as viewed from the opposite side; with one fully developed floret, a sterile lemma and palea below; glumes very unequal, the first glume short, triangular-ovate, prominently 3-nerved, second glume and first lemma of about equal length, green, as long as the spikelet, their tips blunt or merely pointed; the second glume with an inflated saclike base, broadly rounded on the back, with 3 principal nerves; opposite the first lemma an oblong, opaque, membranous palea. Fertile lemma and palea cartilaginous, the margins of the lemma inrolled over the margins of the palea and

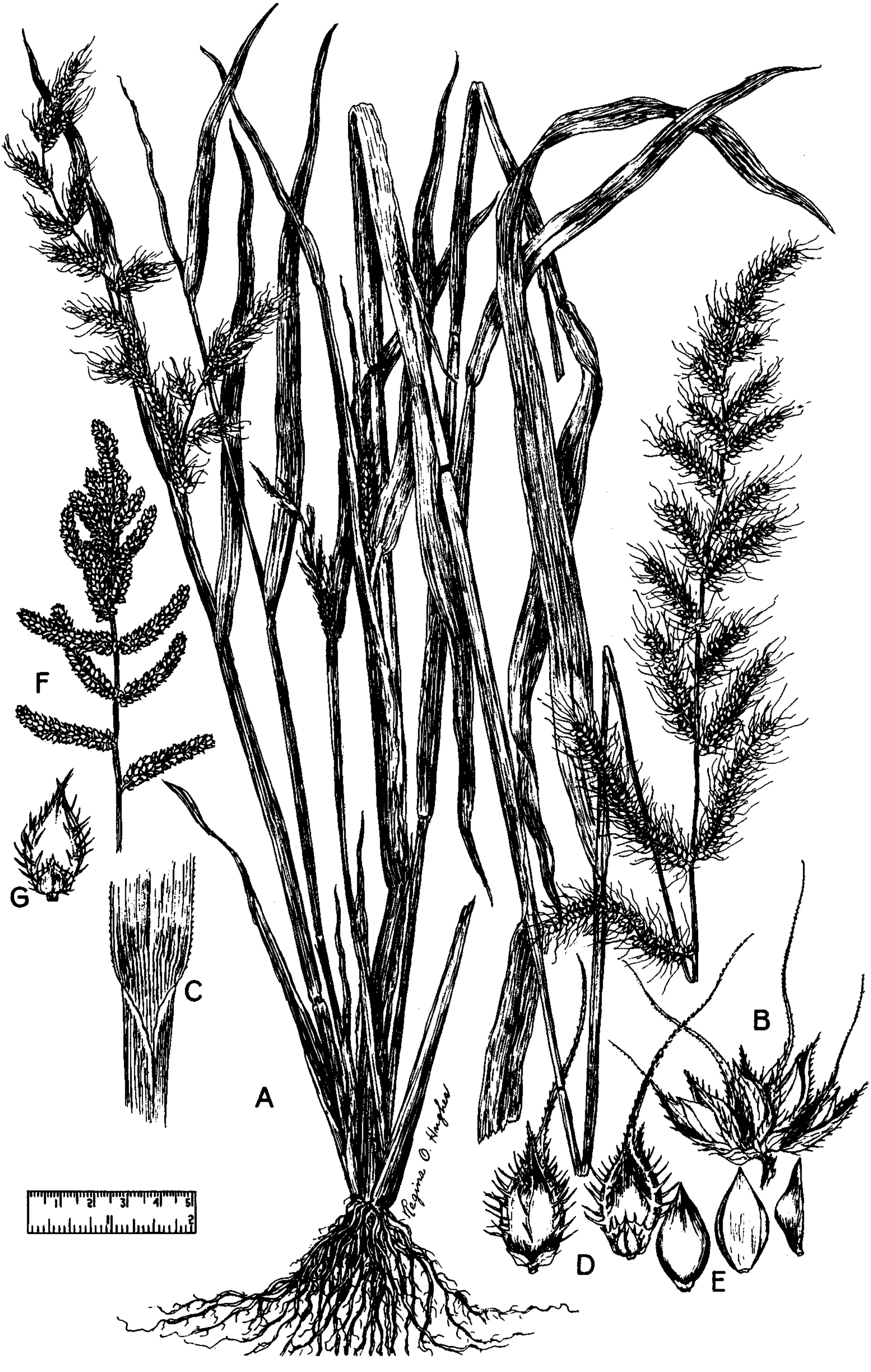
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Fig. 86. **Echinochloa crusgalli:** A, habit; B, spikelet cluster; C, ligule; D, spikelets; E, florets; F–G, panicle and spikelet of variant. (From Reed, *Selected Weeds of the United States* (1970) Fig. 29)

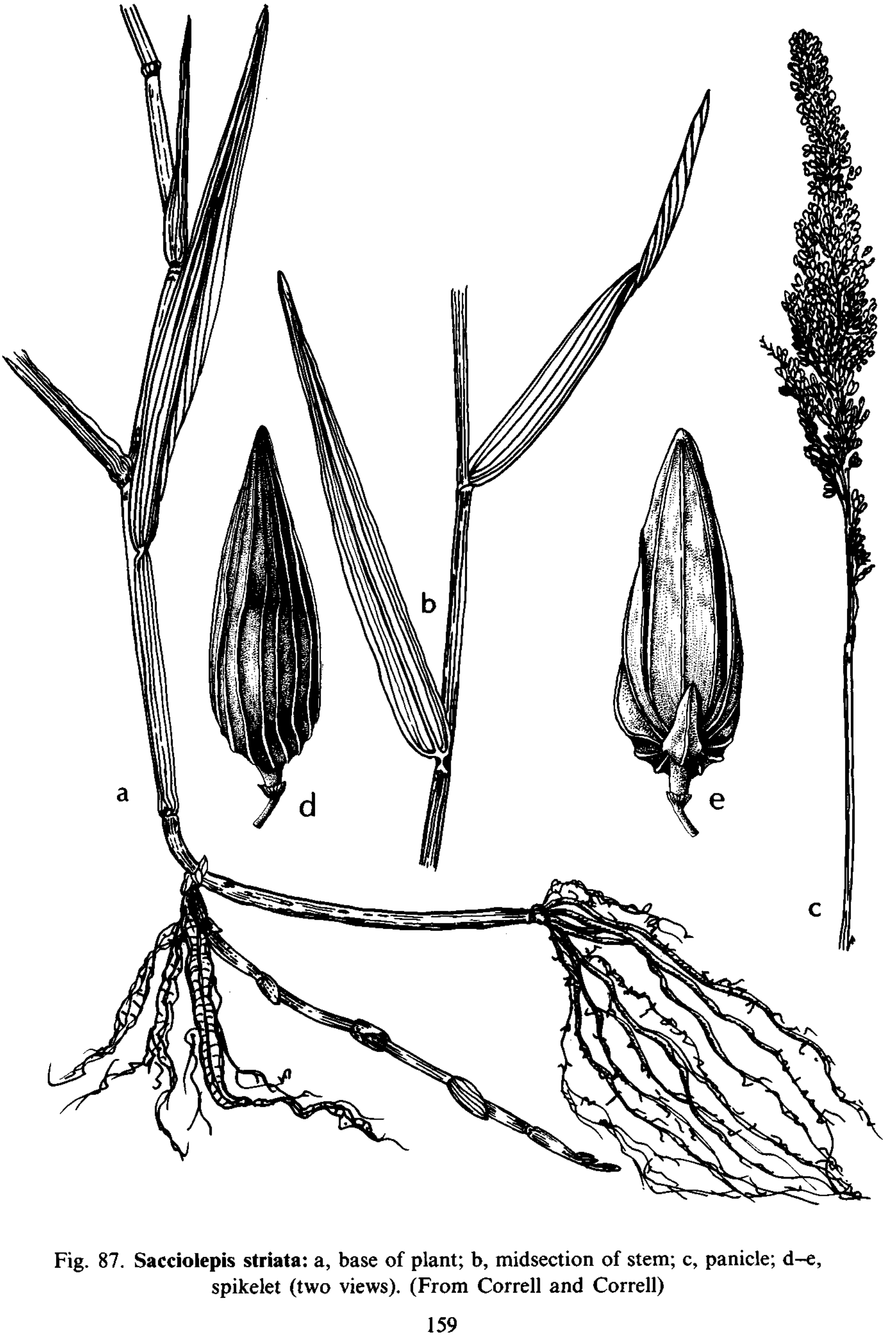

Fig. 87. **Sacciolepis striata:** a, base of plant; b, midsection of stem; c, panicle; d–e, spikelet (two views). (From Correll and Correll)

enclosing them, the two persistent around the grain, the whole then comprising the "fruit." The back of the fertile lemma is convex, the palea flat, thus the "fruit" plano-convex.

Fresh water marshes along streams and on shores of ponds and lakes, in swamps, ditches, and drainage canals, in or out of standing or flowing water. Coastal plain, s. N.J. to Fla., w. to e. Tex., Tenn. and Okla.; W.I.

Note: A second species, *S. indica* (L.) Chase, introduced from India, is of sporadic occurrence in the coastal plain, Fla. to N.C., in moist to moderately wet sites, e.g., fields and ditches. It is a slender annual 2–6 dm tall, with spikelets much as in *S. striata* but somewhat smaller.

24. Setaria (BRISTLY FOXTAILS)

Annuals or perennials with flat leaves. Inflorescence commonly spikelike and cylindrical, compact or somewhat loose and open in some. Spikelets 2-flowered, plano-convex, the lower staminate or rudimentary, the upper bisexual, subtended by 1–several scabrous bristles. (Some spikelets on a given branch may abort so that careful examination is necessary to discern the correct bristle number below a given spikelet). First glume shorter than second, triangular to ovate, 3–5-nerved, half the length of the spikelet or less; second longer, sometimes equalling the spikelet length. Sterile lemma as long as the spikelet, similar to second glume. Fertile lemma hard, convex on the back, its margins inrolled over the edges of the hard palea, its surface smooth, papillate, or very finely reticulate, in some with irregular transverse corrugations. Articulation is above the bristles; in most the spikelets fall intact.

Of the several species of *Setaria* occurring in our range, the two treated below inhabit natural wet sites (although sometimes weedy in addition). The others, most of them introduced, occur in a wide variety of disturbed places, cultivated fields, etc.

- Plant a robust annual, to 3–4 m tall and the stem to 2 cm thick basally or a little more; inflorescence as much as 5 dm long and 3–6 cm broad. 1. *S. magna*
- Plant a slender perennial, to about 8 dm tall, and with slender knotty rhizomes; inflorescence to 1 dm long, commonly shorter, and to 1.5 cm broad. 2. *S. geniculata*

1. Setaria magna Griseb. GIANT FOXTAIL.

Coarse annual, 2–4 m tall, the stem simple, as much as 2 cm across basally, often with conspicuous prop roots from the lower nodes. Leaf blades to 5 dm long and the larger 3–5 cm wide, usually scabrous on both surfaces and marginally, sheaths smooth. Inflorescence usually a dense cylindrical panicle, the lateral branches ascending and closely overlapping (rather distant on occasional specimens and then lobulate), mostly 2–3 dm long and about 3–4 cm broad, commonly nodding. Usually 1 bristle below each spikelet, this very much longer than the spikelet. Spikelets 2 mm long or slightly longer, elliptic to obovate, first glume short, broadly ovate, apically obtuse; second and sterile lemma as long as the spikelet; fertile lemma smooth and shiny. (*Chaetochloa magna* (Griseb.) Scribn.)

Marshes, both fresh and brackish, often in water, swales, bayous, ditches, shores, moist fallow fields. Coastal plain, N.J. to s. Fla., w. to Tex.; W.I., C.Am.

2. Setaria geniculata (Lam.) Beauv. KNOTROOT BRISTLEGRASS.

Slender perennial with slender knotty rhizomes (the rhizomes ofttimes not on herbarium specimens which have been poorly collected). Stems usually several from the base, erect or decumbent basally, 4–8 dm tall, the lower stems usually narrower than above and wiry. Leaf blades 3–8 mm wide, mostly erect-ascending. Inflorescence a densely cylindrical, spikelike panicle, 1–8 (–10) cm long, usually about 1.5 cm broad. Bristles 4–8 below each spikelet, 5–12 mm long. Spikelets 2–2.5 mm long, elliptic; first glume about ⅓ the length of the spikelet, ovate, apically broadly obtuse to rounded, second about ⅔ as long as the fertile floret; fertile lemma surficially granular or very finely reticulate. (*Chaetochloa geniculata* (Lam.) Millsp. & Chase)

Brackish or fresh marshes, saline flats, seasonally wet pinelands, ditches, wet clearings, shores of ponds and lakes, interdune swales, borders of swamps, swales. Mass. to s. Fla., Va., W.Va. to Kans., s. to Tex.; w. to Calif.; to Argen. and Chile; W.I.

25. Pennisetum

Pennisetum purpureum Schum. NAPIER GRASS, ELEPHANT GRASS.

Robust perennial, commonly in very large clumps or clones, perennating by stout, almost bulblike basal offshoots. Stems to about 4 m tall, more or less glaucous, little if any branched below, often with several slender erect branches above, each with an inflorescence at the summit; nodes at first with a prominent ring of white hairs 8–10 mm long, later smooth. Leaf blades linear below, long-tapering above, mostly 1.5–2.5 cm wide at the widest points, pilose near the base, especially marginally; midrib whitish above, strongly keeled below. Inflorescence straight-cylindrical, tawny olivaceous, varying in length, the longest about 20 cm, about 2 cm across; at maturity the somewhat flexuous inflorescence stalks extend beyond the uppermost sheath for about 15–20 cm. Spikelets single or in close clusters of 2–3, extending from the axis at right angles, the lower sometimes reflexed and the upper ascending; numerous yellowish bristles of unequal length arise from the axis below the spikelet(s), these surficially mostly upwardly scabrous, but some more or less plumose.

Native to Africa. Commonly and very abundantly naturalized in s. Fla., forming rank growth along canals and roadsides and generally in areas of human disturbance, to some extent weedy in sugar cane fields; less common and abundant n. to cen. Fla., sporadic in n. Fla. (perhaps beyond).

26. Amphicarpum

Annual or perennial, aerial stems with terminal inflorescences. Leaf blades flat, finely striate, with pale cartilaginous margins. Spikelets in a terminal aerial panicle and borne singly terminating very slender subterranean branches, the latter cleistogamous, much the larger, straw-colored; aerial spikelets bisexual but reportedly do not mature seeds, the subterranean ones do. Aerial spikelets: stalked, lanceolate, first glume, if present, variable in size but much shorter than the spikelet, commonly lacking; second glume and sterile lemma subequal, firm-membranous, 3–5-nerved; fertile lemma and palea hard, not inrolled. Subterranean spikelets: oval or elliptic, apex acuminate, first glume lacking; second glume and sterile lemma subequal, finely many-nerved, firm-rigid; fertile lemma and palea very hard, not inrolled; all parts straw-colored; at maturity, the "fruit" enlarged such that it bulges from between the second glume and sterile lemma.

- Sheaths and leaf surfaces uniformly clothed with longish pustular-based hairs. 1. *A. purshii*
- Sheaths with pustular-based hairs at or near the margins, leaf surfaces glabrous. 2. *A. muhlenbergianum*

1. Amphicarpum purshii Kunth. Fig. 88

Annual. Stems to about 8 dm tall. Leaf sheaths and blades hirsute with pustular-based hairs; margins of the blades with a more or less cartilaginous band, this bearing the pustular-based longish hairs and also unevenly or intermittently very very finely scabrid; blades broadest at the base then gradually tapering to the apex, the larger 1–1.5 dm long, 1–1.5 cm wide. Panicle variable, sometimes with a few very short and narrow lateral branches from a main axis, or with several ascending narrow laterals to 1.5 dm long. (*Amphicarpon amphicarpon* (Pursh) Nash)

Moist pine savannas or flatwoods, moist to wet sandy or sandy-peaty pond margins or shallow pools. Coastal plain, N.J. to Ga.

2. Amphicarpum muhlenbergianum (Schult.) Hitchc. Fig. 89

Perennial; leafy stems sometimes creeping, rooting at the nodes, and bearing intermit-

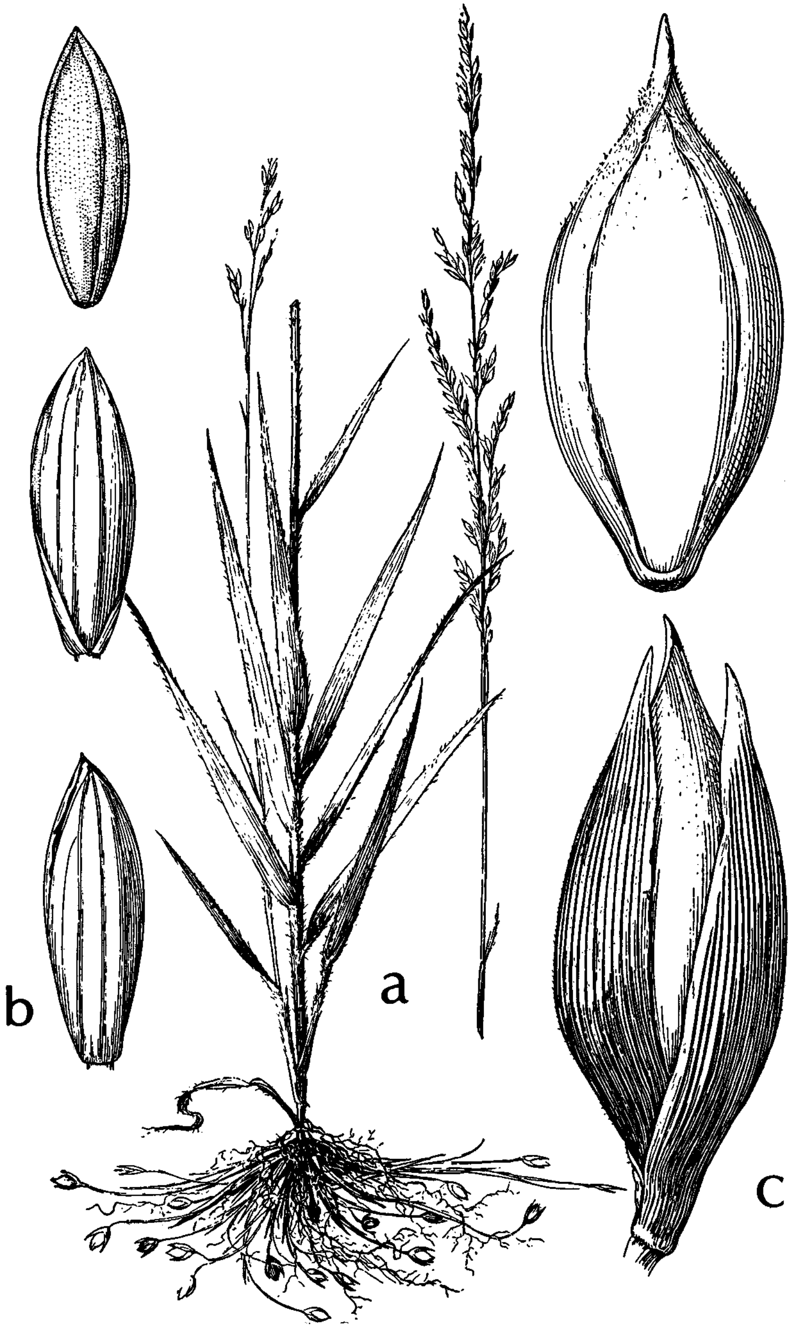

Fig. 88. **Amphicarpum purshii:** a, habit; b, aerial spikelet (two views) and floret; c, subterranean spikelet and floret. (From Hitchcock and Chase)

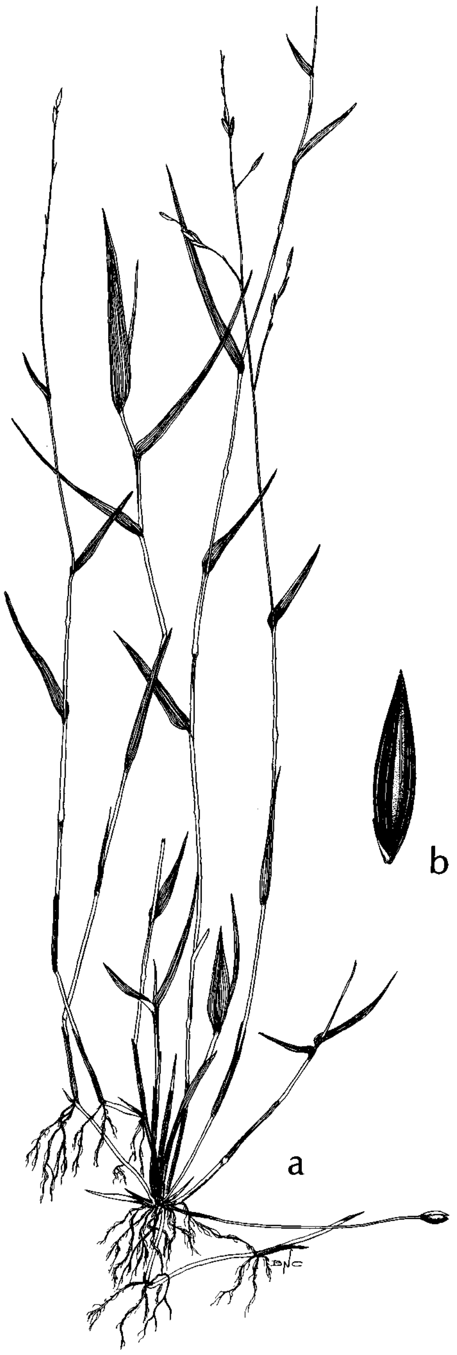

Fig. 89. **Amphicarpum muhlenbergianum:** a, habit; b, spikelet.

tently aerial flowering stems; also with subterranean slender rhizomes bearing bladeless sheaths; aerial stems tufted, usually with several branches from near the base, these decumbent below. Sheaths pubescent on or near the margins with pustular-based longish hairs, blades glabrous, with a marked pale cartilaginous band marginally; blades broadest somewhat above the base, the larger about 1 dm long and 8–10 mm wide. Panicle narrow, few-flowered. (*Amphicarpon floridanum* Chapm.)

Moist to wet pine savannas and flatwoods, exposed shores or bottoms of ponds and lakes, borders or banks of marshes, often on spoil banks. Coastal plain, S.C. to s. Fla., Fla. Panhandle, s. Ala.

27. Erianthus (PLUMEGRASSES)

Tall, stout, reedlike perennials, usually with basal offshoots or short arching rhizomes and forming clumps. Leaves long and flat. Ligule a rounded or truncate collarlike membrane fringed with short hairs, usually a zone of long hairs on the base of the blade above the ligule. Panicles terminal, large, usually dense, elongate-cylindrical to oblong, comprised of one primary axis on which are borne spikelet-bearing secondary branches or short panicles. Spikelets in pairs, one sessile, the other pedicillate, the axis continuous, the segment bearing the next higher pair of spikelets looking essentially like the pedicel of the pedicillate spikelet opposite it except that it is a little shorter and stouter. The spikelet-bearing axis disjoints below each sessile spikelet, and disarticulation of the pedicillate spikelet is at the end of its pedicel and just below the stipelike bearded base of the spikelet. Thus the sessile spikelet drops with the pedicel of the pedicillate spikelet attached to one side and the next higher segment of the continuing axis (from which the sessile spikelet next above has disarticulated) on its other side. In most species, each spikelet is subtended by a short stipelike base bearing a ring of long silky hairs. Spikelets of the pair alike, bisexual. Glumes two, equal, the body boatlike, hard and cartilaginous on the back, the tips attenuate, the first glume about ⅔ surrounding the spikelet. A first (sterile) thin-membranous lemma fits within the first glume. Second (fertile) lemma with a very short, thin-membranous body which is deeply seated within the inrolled edges of the second glume, abruptly tapering to a long stiff awn exserted from the tip of the glume. Palea small, very thin-membranous, within the fertile lemma.

1. Panicle branches stiffly appressed-ascending, to the naked eye appearing not at all woolly; spikelets wholly lacking a basal ring of hairs, or this, if present, sparse and the hairs short and not at all conspicuous. 1. *E. strictus*
1. Panicle branches loosely ascending or spreading, stiff or flexuous, but not markedly appressed, to the naked eye appearing woolly; spikelets with a definite and conspicuous basal ring of silky hairs.
  2. Lower portion of the awn spirally twisted, flat.
    3. Stems just below the panicle glabrous to sparsely pubescent; panicle branches somewhat stiffly though loosely ascending; spikelets brown and often suffused with a purplish color, the hairs of the basal ring not exceeding the spikelet in length and rendering the panicle only moderately woolly to the naked eye. 2. *E. contortus*
    3. Stems below the panicle copiously hairy; panicle branches flexuous and loosely spreading; spikelets straw-colored, the hairs of the basal ring exceeding the spikelet in length and rendering the panicle abundantly silky-woolly to the naked eye. 3. *E. alopecuroides*
  2. Lower portion of the awn not spirally twisted, not flat.
    4. Hairs of the basal ring, or the longer of them, not exceeding the spikelet in length; glumes and pedicels of the stalked spikelets sparsely long-hairy. 4. *E. brevibarbis*
    4. Hairs of the basal ring, or the longer of them, exceeding the spikelet in length; glumes and pedicels of the stalked spikelets clothed with long hairs. 5. *E. giganteus*

1. Erianthus strictus Baldw. ex Ell. NARROW PLUMEGRASS. Fig. 90

Plants 1–2 m tall, relatively slender, glabrous, the nodes bearded only when young, somewhat glaucous. Leaf blades relatively narrow, 5–12 mm broad. Panicle narrow, with stiff, closely appressed-ascending branches, not at all woolly to the naked eye.

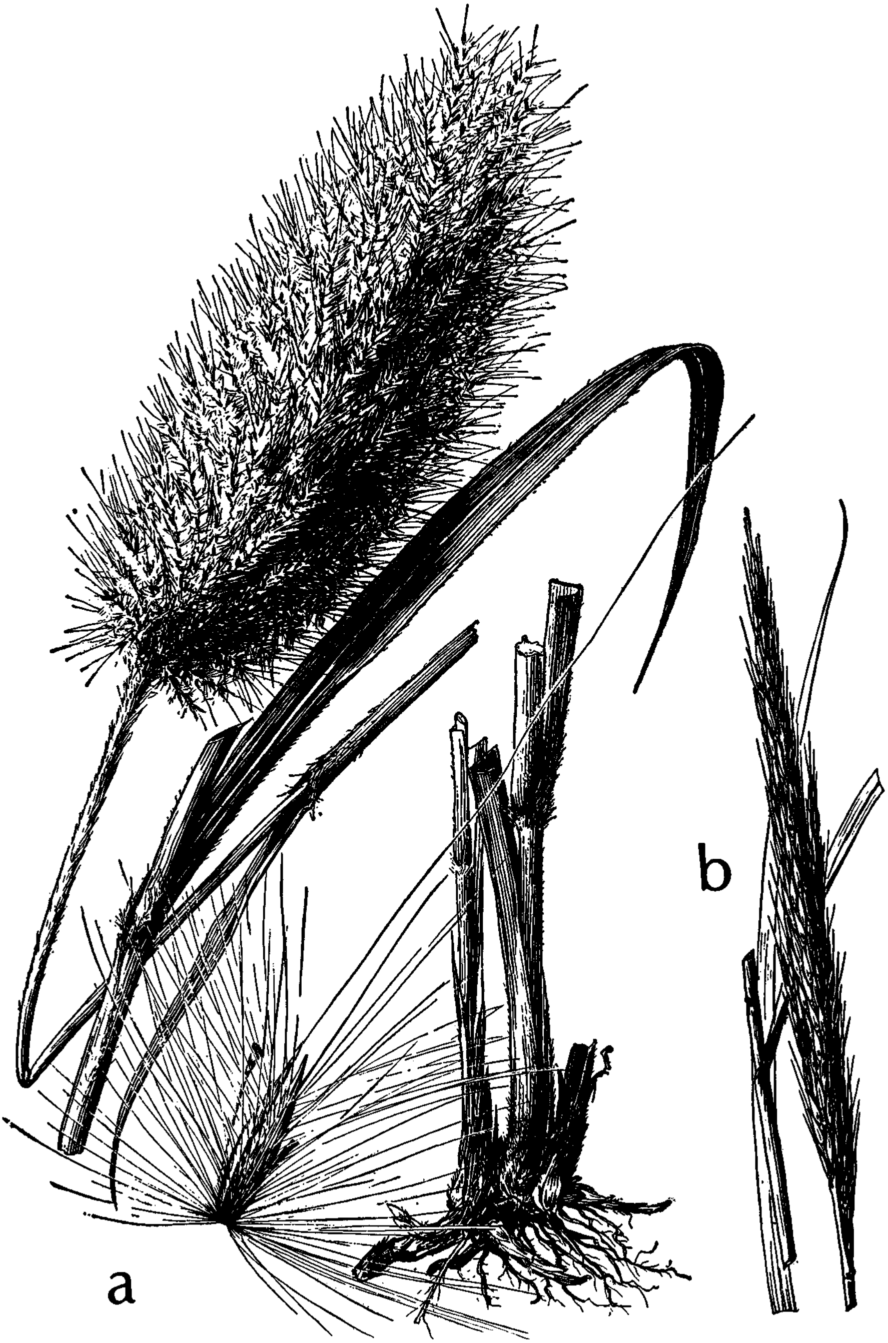

Fig. 90. a, **Erianthus giganteus**: base of plant, panicle, and spikelet; b, **Erianthus strictus**: small portion of stem, panicle. (From Hitchcock and Chase)

Primary axis of the panicle, pedicels, and segments of the spikelet-bearing axis puberulent. Spikelets lanceolate, appressed, about 8 mm long, brown to purplish, wholly lacking a basal ring of hairs, or if this is present the hairs short and inconspicuous. Glumes nerved, sparsely pubescent with short, stiff ascending hairs and with short-ciliate margins. Awns of the lemma stiff and relatively straight, terete, scabrous, not spirally twisted, ca. 15–18 mm long.

Swales, marshes, edges of swamps, drainage ditches and canals, depressions in pine flatwoods. Coastal plain, s.e. Va. to Fla., w. to e. Tex., Ark., Tenn., and Mo.

2. **Erianthus contortus** Baldw. ex Ell. BENT-AWN PLUMEGRASS.

Plants 1–2 m tall, relatively slender to moderately stout; stem rather sparsely pubescent below the panicle, otherwise glabrous, the nodes pubescent when young. Leaf blades mostly 1–1.5 cm wide, slightly scabrous on the margins. Panicle with loosely ascending, flexuous branches, appearing only moderately woolly to the naked eye. Primary axis of the panicle, pedicels, and segments of the spikelet bearing axis puberulent and bearing long silky hairs. Spikelets lanceolate, about 7 mm long, brown to purplish, the hairs of the basal ring to about as long as the spikelet. Glumes faintly nerved, bearing long, spreading silky hairs, the midvein and attenuate tips scabrous. Awn of the lemma flat basally, spirally twisted and spreading, about 2 cm long.

Open woods, borders of woodlands, and damp clearings. N.J. to s. Ind., Ill., and Mo.; to Fla., w. to e. and s.e. Tex., Okla.

3. **Erianthus alopecuroides** (L.) Ell. SILVER PLUMEGRASS.

Plants stout, 1.5–3 m tall; stems and leaf sheaths glaucous, the stem below the panicle copiously silky-hairy. Bearded at the junction of the leaf sheath and the blade, upper surface of the lowermost portion of the blade long-hairy, blades mostly 2–3 cm wide, scabrous on both surfaces and along their margins. Panicle loose, the branches ascending or spreading, copiously woolly and silvery or purplish plumelike to the naked eye. Primary axis of the panicle abundantly clothed with long silky hairs; the pedicels and segments of the spikelet-bearing axis also bearing long silky hairs but not densely so. Spikelets about 6 mm long, lanceolate, straw-colored, hairs of the basal ring exceeding the spikelet in length. Glumes faintly 1-nerved, abundantly clothed with silky hairs that extend well beyond the glumes. Awn of the lemma flat, scabrous, spirally twisted and spreading, mostly 12–15 mm long.

Not usually in very wet sites, often in dry upland ones, moist to dry open woods, borders of woodlands, and damp clearings. N.J. to s. Ind., Ill., and Mo.; to Fla., w. to e. and s.e. Tex., Okla.

4. **Erianthus brevibarbis** Michx.

Plants 1–2.5 m tall, stout, the stem below the panicle pubescent, bearded at the nodes when young, otherwise glabrous. Leaf sheaths pubescent only on their upper portions; blades pubescent near their bases, slightly scabrous on their surfaces and margins, 5–15 mm wide. Panicle with loosely ascending branches, appearing only moderately woolly to the naked eye. Primary axis of the panicle puberulent, the pedicels and spikelet-bearing segments of the axis puberulent and sparsely clothed with long silky hairs. Spikelets lanceolate, 4.5–7 mm long, brown, hairs of the basal ring not exceeding the spikelet in length. Glumes with a prominent green nerve only on the tips, the surfaces puberulent and bearing scattered long silky hairs. Awn of the lemma terete, scabrous, not spirally twisted, essentially erect, variable in length from about 1.5–2.5 cm long. (*E. coarctatus* Fern.)

Sandy-peaty swales, ditches, and drainage canals, margins of swamps, and moist clearings. Del., Md., to Fla., w. to La.

5. **Erianthus giganteus** (Walt.) Muhl. Fig. 90

Plants robust, to 3 m tall; the stem below the panicle pubescent, the nodes prominently bearded, at least when young, otherwise glabrous. Leaf sheaths pubescent at least near their summits and along their margins, sometimes copiously pubescent throughout; the blades glabrous to copiously pubescent, their margins but not their surfaces scabrous, narrow, or to 2.5 cm wide. Panicle with loosely ascending flexuous branches, appearing rather abundantly woolly to the naked eye. Primary axis of the panicle copiously clothed with long silky hairs, the pedicels and segments of the spikelet-bearing axis with short stiff hairs and long silky spreading hairs. Spikelets lanceolate, brown, 5–7 mm long, hairs of the basal ring exceeding the spikelet in length. Glumes with a prominent green nerve on their tips, sometimes throughout their length, the surfaces smooth or somewhat puberulent and conspicuously clothed with long silky hairs. Awn of the lemma terete, scabrous, essentially erect, 2–2.5 cm long. (*E. saccharoides* Michx.)

Marshes, ditches and drainage canals, depressions in pine flatwoods, edges of swamps, swales, moist to wet clearings. N.Y. to Fla., mostly on the coastal plain and lower piedmont, w. to e. and s.e. Tex., Ark; Tenn; and Ky.

28. Sorghum

Sorghum halepense (L.) Pers. JOHNSON GRASS. Fig. 91

Robust perennial, extensively scaly-rhizomatous and colonial, rhizomes usually deep seated in the substrate. Stems 5–15 (–20) dm tall, nodes rather sparsely appressed-pubescent, internodes glabrous. Leaf blades flat, to about 6 dm long and 2 cm wide, appressed-hirsute on the inside at the base, margins finely scabrous; ligule an apically fringed scale. Panicle open, terminal, 1.5–5 dm long, the principal branches naked below, widely spreading to ascending, floriferous on short branchlets in the upper half to two-thirds. Spikelets in pairs at the nodes of a jointed axis, one sessile, the other stalked (terminally on a branchlet one sessile and two stalked), the sessile one bisexual, the stalked staminate. Joints of the axis and spikelet stalks usually pubescent. Disarticulation is below the sessile spikelet, the joint with its spikelets falling as a whole. Spikelets lanceolate to ovate, apically long-acute, 4.5–5.0 mm long, with short-silky pubescence (pubescence sometimes shed by maturity); glumes as long as the spikelet, those of the sessile one hard, those of the stalked one usually more membranous; glumes of stalked spikelets usually purple throughout, sometimes only slightly suffused with purple, those of the sessile spikelet usually somewhat suffused with purple, sometimes wholly stramineous; lemma of the fertile floret usually with a bent-twisted awn but this easily and early detached.

Fields, roadsides, ditches, depressions, flourishing under a considerable range of moisture conditions. Introduced from Mediterranean regions, now a pernicious weed. Mass. to Iowa, Kans., generally southward to s. Fla., Tex., thence w. to s. Calif.

Note: In fallow muck fields and sugar cane fields, in ditches and on banks of canals and sloughs, southward of Lake Okeechobee, Florida, there is a relatively recently introduced *Sorghum*, purportedly *S. verticilliflorum* (Steud.) Staph in Prain. It is a coarse annual, apparently somewhat more robust than *S. halepense,* leaves larger, to 4–5 cm broad, and with a very stout midrib. Inflorescence much as in *S. halepense* in dimensions but the axes more flexuous, the branchlets arching and drooping distally. Spikelets 6 mm long or a little more, stramineous below, green distally, lacking in purple coloration (in few specimens seen).

Native in E. Afr.

29. Andropogon

Perennials, rhizomatous or tufted, mostly the latter. Stems erect. Leaf sheaths usually keeled, glabrous or pubescent, the margins scarious, blades flat or folded lengthwise; ligule membranous. Spikelets disposed on jointed spikelike branches borne 2–4 (rarely 1) digitately on stalks, exserted from or partially enclosed by spathes; overall inflorescence long, slender and little branched, elongate and moderately branched, or much branched, either in dense masses on an elongate axis or in dense terminal masses.

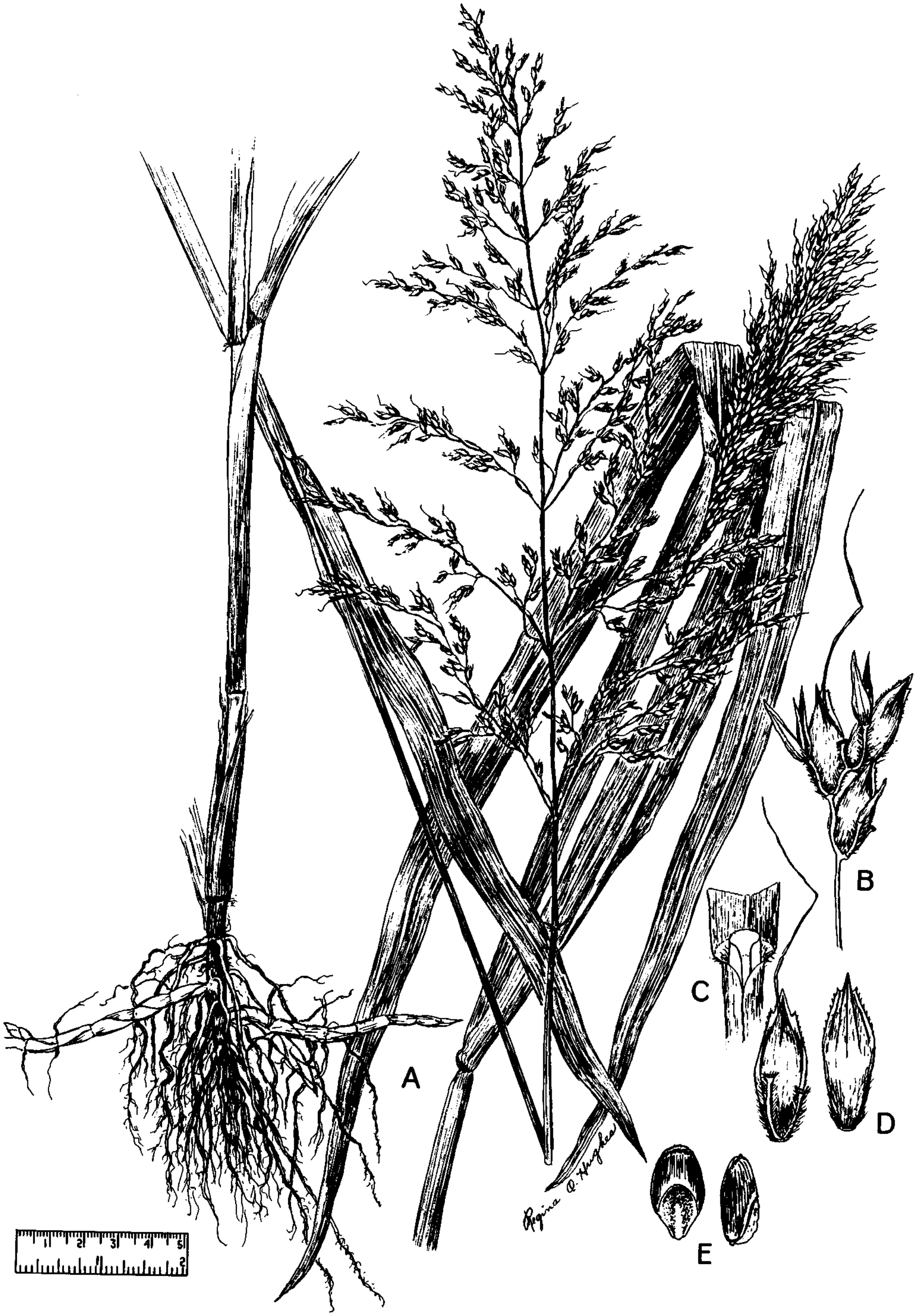
B
C
A
D
E
1 2 3 4 5
Regina O. Hughes

Fig. 91. **Sorghum halepense:** A. habit; B, cluster of spikelets; C, ligule; D, spikelets; E, grains. (From Reed, *Selected Weeds of the United States* (1970) Fig. 41)

Spikelets paired, one of the pair sessile and bisexual, the other stalked and staminate, very much reduced and neuter, or reduced even to the spikelet stalk. First glume coriaceous, flattened, 2-nerved, sometimes longitudinally furrowed, emarginate apically, scabrid on the nerves, its margins inrolled; fertile and sterile lemmas scarious, entire or bidentate, the fertile usually awned, the awn bent or twisted. Disarticulation at the base of the sessile spikelet.

1. Spikelets of the pair appearing much alike except that the stalked one is awnless; sessile spikelet bisexual, the stalked one staminate. 1. *A. gerardii*
1. Spikelets of the pair unlike, sessile one bisexual, the stalked reduced to stalk and glumes, or reduced to the stalk.
  2. Ultimate spikelet-bearing branches 4 (–6) in the cluster. 2. *A. mohrii*
  2. Ultimate spikelet-bearing branches 2 (–3) in the cluster.
    3. Plants glaucous, the lower sheaths often chalky glaucous.
      4 Branchlets glabrous below the spathes. 3. *A. capillipes*
      4. Branchlets long-hairy just below the spathes. 4. *A. glaucopsis*
    3. Plants not glaucous.
      5. Spikelet-bearing branches at full maturity extending well beyond the subtending spathes. 5. *A. brachystachys*
      5. Spikelet-bearing branches at full maturity not extending beyond the spathes.
        6. Inflorescence slender, elongate, simple or nearly so, i.e., one spikelet cluster per node or 2–3. 6a. *A. virginicus* var. *virginicus*
        6. Inflorescence a compact, obconic or corymbiform, densely glomerately branched terminal mass, or several to numerous such masses along the main axis. 6b. *A. virginicus* var. *abbreviatus*

1. Andropogon gerardii Vitman. BIG BLUESTEM. Fig. 92

Plant coarse and tall, tufted or short-rhizomatous and tufted. Stems 1–2 m tall, the inflorescence sparingly branched. Leaf sheaths glabrous to densely pubescent, scabrous marginally. Inflorescence branches long-exserted and bearing 2–3 (–6) spikelet-bearing branches, these 5–10 cm long, green or often purplish; joints and spikelet stalks long-ciliate; awn of the fertile lemma tightly twisted below, bent above, brown, 1–2 cm long.

Commonly in open or relatively open well-drained sites; in our range, at least, sometimes in moist to wet swales, pine savannas and flatwoods, and hillside bogs. Maine and Que. to Sask. and Wyo., generally southward to n. Fla., Tex. and N. Mex.

2. Andropogon mohrii (Hack.) Hack. ex Vasey.

Stems usually solitary, relatively coarse, from about 1–1.5 m tall. Leaf sheaths and blades villous. Spikelet-bearing branches 4–6, 3–4 cm long, their stalks (except possibly that of the terminal cluster) not exserted from the inflated spathes, usually only one cluster per node, sometimes more; axis bearing the spikelets long-pubescent as is the stalk (all there is) of the so-called stalked spikelet. Awn of the fertile lemma 1–2 cm long or a little more, straight, little if any twisted below.

Bogs, depressions in pine savannas and flatwoods. Coastal plain, Va. to Ga. and La.

3. Andropogon capillipes Nash.

Tufted. Plant glaucous, the lower sheaths usually chalky glaucous, commonly somewhat purplish gray throughout. Stems slender, 6–10 dm tall. Leaf sheaths crowded at the base, the blades mostly folded. Inflorescence more or less fastigiate. Stalked spathes mostly 1–3 at a node along the upper half to two-thirds of the stem, filiform and flexuous, commonly arching or recurved; stalk below the spathe glabrous and strongly glaucous; stalks bearing the spikelet cluster not exserted from the spathe, the spathe as long as the spikelet cluster, 2–3.5 cm long. Ultimate spikelet-bearing branches usually 2, the axis and sterile stalk copiously long-pubescent. Awn of the sterile lemma nearly straight, about 2 cm long. (*A. virginicus* var. *glaucus* Hack.)

On well-drained sand ridges with longleaf pine and scrub oaks, sandy banks, interdune swales where only seasonally wet, occasional in moist sandy-peaty soils of clearings. Fla. (also N.C. to Ga.?).

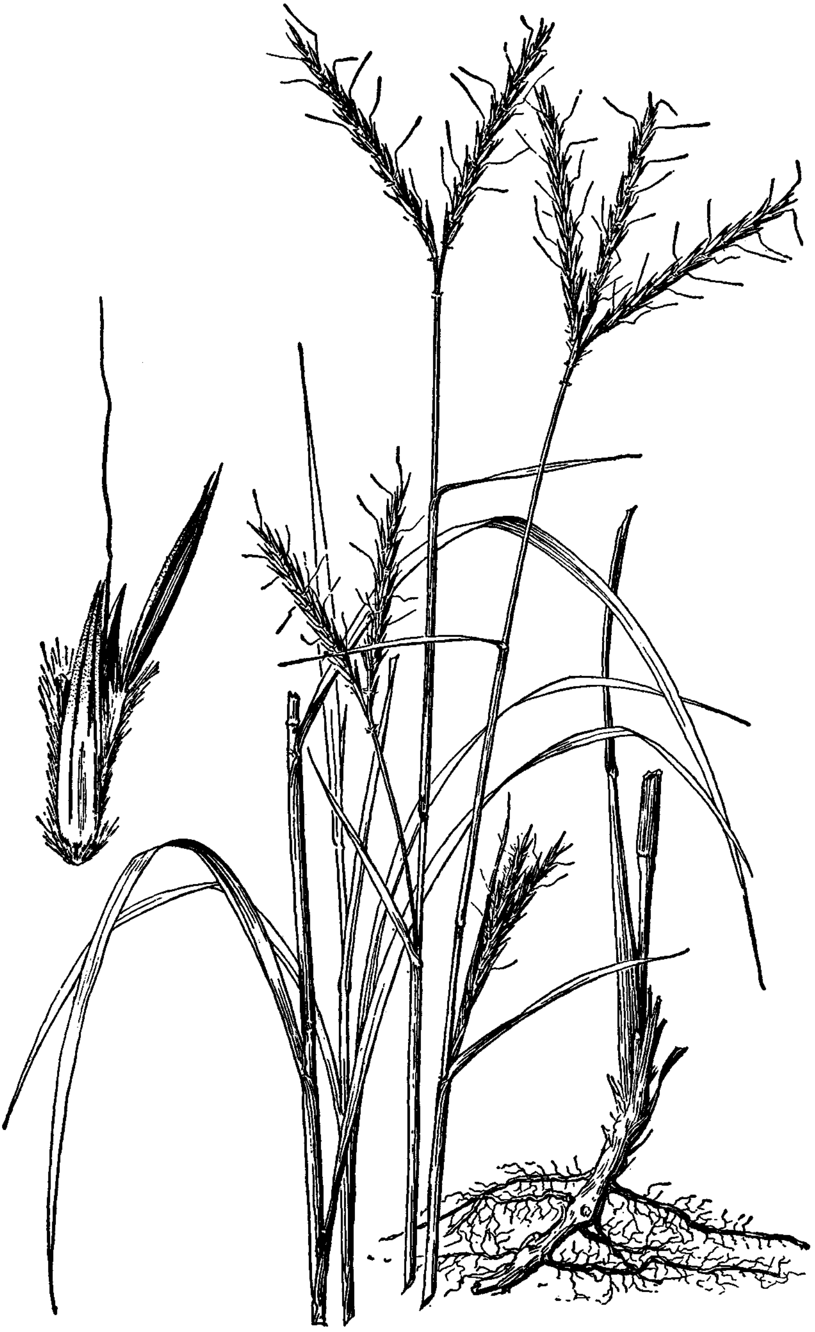

Fig. 92. **Andropogon gerardi:** habit and spikelet. (From Hitchcock and Chase)

4. Andropogon glaucopsis (Ell.) Nash.

In general habital appearance much like *A. capillipes*, the lower stems and sheaths usually not so heavily chalky glaucous. Stalk below the spathe not glaucous or only weakly so, a tufted ring of hairs at its summit. (*A. virginicus* var. *glaucopsis* (Ell.) Hitchc.)

In heavily peat- or muck-laden sandy soils, pine savannas and flatwoods depressions, drainage ditches, swales, shores of ponds, moist to wet clearings, borders of wet woodlands and swamps. Coastal plain, s. Md. to Fla., w. to La.

5. Andropogon brachystachys Chapm.

Tufted. Stems relatively slender, 1–1.5 m tall. Inflorescence comprising the upper half of the stem, loosely branching and very graceful. Stalks just below the spathes pubescent. Spathes on filiform, flexuous stalks; from each spathe a long-exserted filiform-flexuous stalk with two spikelet-bearing axes at its summit, these 1–1.5 cm long, the axis and sterile stalk long-pubescent, the spikelets purplish gray. Awn of the sterile lemma straight, 5–7 mm long.

Pine flatwoods, cypress-gum ponds or depressions though mostly only on their margins at times of low water. S.e. Ga., n.e., n. cen., and pen. Fla., Fla. Panhandle.

6. Andropogon virginicus L.

Tufted. Plants green or glaucous. Inflorescence simple or subsimple to densely glomerately branched. Spathes subsessile to short-stalked, 2–6 cm long, in length about equal to the spikelet-bearing axes, these in pairs. Stalk pubescent just below the spathe. Fertile spikelet shorter than the sterile pedicel, longer than the internode just above it. Awn straight, 1–2 cm long.

Andropogon virginicus, especially in the coastal plain, is polymorphic and we are unable to delimit clear-cut segregate taxa. We choose to recognize the following two varieties.

6a. A. virginicus var. **virginicus.** Fig. 93

Inflorescence simple or subsimple, the spikelet-bearing clusters evenly disposed along the main axis, not glomerate.

Mostly in well-drained soils, old fields, sparsely wooded areas; in the coastal plain often abundantly colonizing shores of ponds exposed at times of low water, and moist to wet clearings where the soil has been mechanically disturbed. Mass. to Ohio, Mo., and Kan., s. to Fla. and Tex.

6b. A. virginicus var. **abbreviatus** (Hack.) Fern. & Grisc.

Plant not glaucous. Inflorescence usually densely fastigiately branched, sometimes with a single obconic, dense terminal mass, sometimes elongate and massively fastigiately branched throughout the length.

Sloughs, ditches, canals, borders of mangrove swamps, borders of cypress-gum ponds and swamps, brackish and fresh marshes, pine savannas and flatwoods, swales; occasional in well-drained upland open woodlands. Coastal plain, Mass. to s. Fla., w. to Tex; Tenn., Ky., Ark., Okla, w. to Calif., Nev.; Mex., C.Am., W.I.

30. Arthraxon

Arthraxon hispidus (Thunb.) Makino.

Slender annual with freely branching stems, branches decumbent below and rooting at the nodes, flowering branches ascending and bearing both axillary and terminal narrowly turbinate panicles of spikes on short to long filiform stalks. Stems wiry, glabrous, some usually reddish purple. Sheaths striate, sparsely and unevenly stiff pubescent, the marginal hairs longer; leaf blades ovate-lanceolate, bases cordate, apices acuminate or acute, long-ciliate on the basal auricles, margins otherwise finely scabrous. Rachis

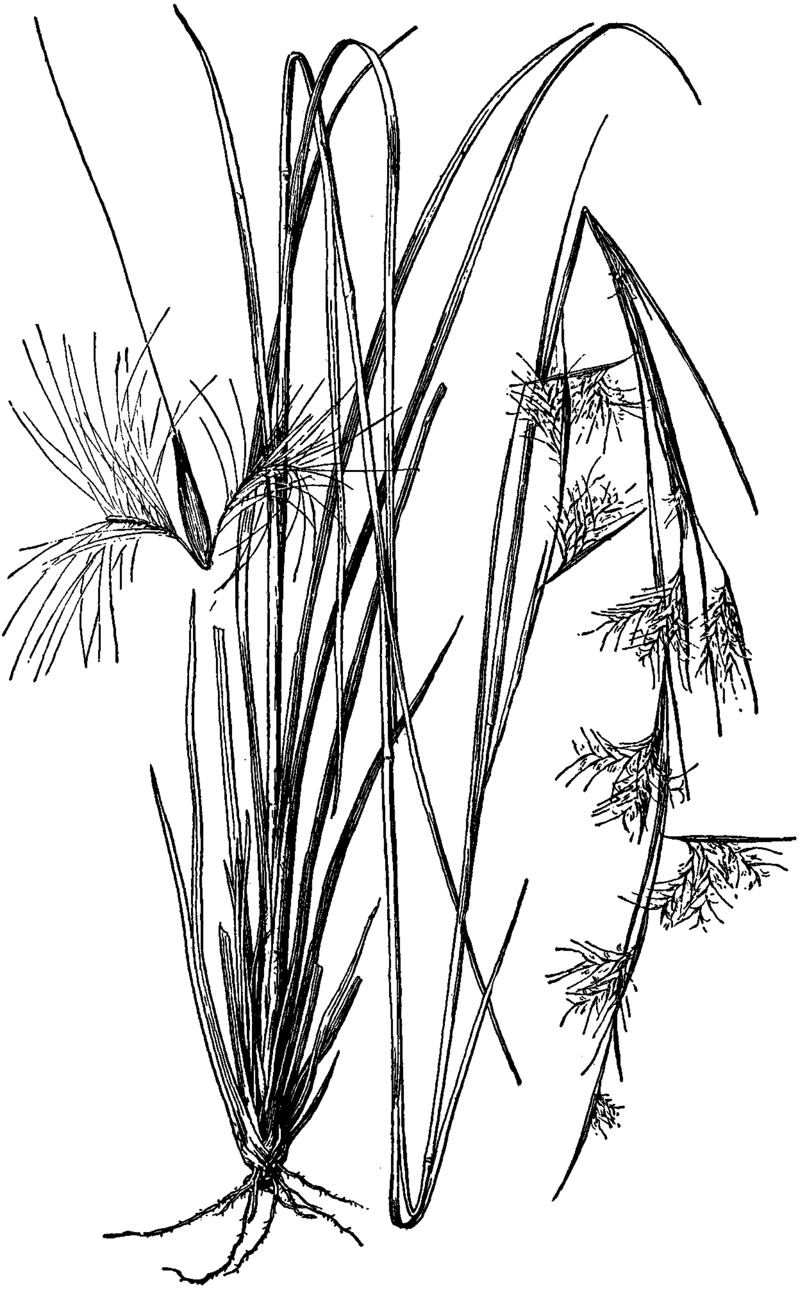

Fig. 93. **Andropogon virginicus** *var.* **virginicus:** habit and spikelet with rachis joint and pedicel. (From Hitchcock and Chase)

jointed, bearing sessile, green to purplish spikelets alternately, these 4–5 mm long excluding the awns if present, the joints shorter than the spikelets. Glumes nearly equal in length, strongly keeled, the outer several-nerved, the inner 1-nerved, its sides membranous, the nerves bearing short pustular-based stiff hairs, these shedding and leaving the pustular bases; lemma thin-membranous, in some specimens awnless, in others bearing a twisted awn from about its base, the awn much exceeding the spikelet.

Moist shores, floodplain forests, ditches, pastures. Native in Asia. Sporadically naturalized from Pa. to Fla., Tenn., Ark. and La.

31. Microstegium

Microstegium vimineum (Trin.) A. Camus.

Slender lax annual, freely branching, the branches decumbent below and rooting at the nodes, often mat-forming; flowering stems ascending, commonly straggling and intertwining. Stems glabrous. Sheaths finely striate, pubescent along the margin; blades lanceolate to linear-lanceolate, apices acute, 2–6 (–8) cm long, glabrous above, sparsely short-pubescent below, margins finely scabrous. Inflorescence terminal, a solitary spike-like raceme or with 2–several subapproximate and subequal branches, or these widely spaced. Rachis jointed, bearing pairs of appressed spikelets alternately at the joints, one of the pair sessile, the other stalked; rachis joints and spikelet stalks pubescent or nearly glabrous. Glumes equal, strongly keeled, firm but thin; the outer (first) glume markedly grooved on one side. Spikelet 4–5 (–6) mm long. Grain brown, linear-elliptical, about 2 mm long, freely shed from the membranous subtending lemma. Palea absent or very small.

Alluvial stream bars, banks of organic debris along streams, floodplain forests, wet banks of streams. Native in Asia. Sporadically naturalized in Ohio, Va., Ky., Tenn., s. to n. Fla., Ala., Miss.

32. Schizachyrium

Perennials, tufted or rhizomatous. Leaf sheaths glabrous or pubescent, blades flat or involute, glabrous or pubescent; ligule membranous. Spikelet-bearing branches spike-like, solitary, stalked, subtended by a spathe. Spikelets paired, one sessile and bisexual, the other stalked (tip of spikelet-bearing branch with a pair of stalked spikelets), the stalked one reduced to the stalk and glumes or just to the stalk and a much reduced glume. Glumes coriaceous, the first flattened, the second keeled; lemmas scarious, the fertile lemma bidentate apically, awned from between the teeth.

1. Plants tufted, not rhizomatous, in some the lower stems decumbent and rooting at the lowermost nodes.
  2. Stem strictly erect; sessile spikelet 6–8 (–10) mm long; pubescence on inflorescence axis and sterile pedicel inconspicuous. 1. *S. scoparium*
  2. Stems decumbent at base, usually rooting at lowermost nodes; sessile spikelet 10 mm long; pubescence on inflorescence axis and sterile pedicel conspicuous. 2. *S. littorale*
1. Plants rhizomatous (rhizomes apparent if bases of plant carefully removed from substrate).
  3. Sessile spikelet 5–7 mm long (excluding the awn); stalked spikelet comprised of a much reduced glume.
    4. Axis of inflorescence conspicuously tortuously curved-zigzag, its joints about equal in length to the sessile spikelet. 3. *S. rhizomatum*
    4. Axis of inflorescence only moderately zigzag, not curved-zigzag, the joints shorter than the sessile spikelet. 4. *S. stoloniferum*
  3. Sessile spikelet about 10 mm long (excluding the awn); stalked spikelet comprised of two well-developed glumes. 5. *S. maritimum*

1. Schizachyrium scoparium (Michx.) Nash. LITTLE BLUESTEM. Fig. 94

Stems tufted, strictly erect, sometimes glaucous, commonly purplish, 4–15 dm tall. Leaf sheaths rarely pubescent throughout, usually pubescent at junction with the blade; blade flat, 2–10 mm wide. Spathes subtending the spikelet-bearing branch inconspicuous;

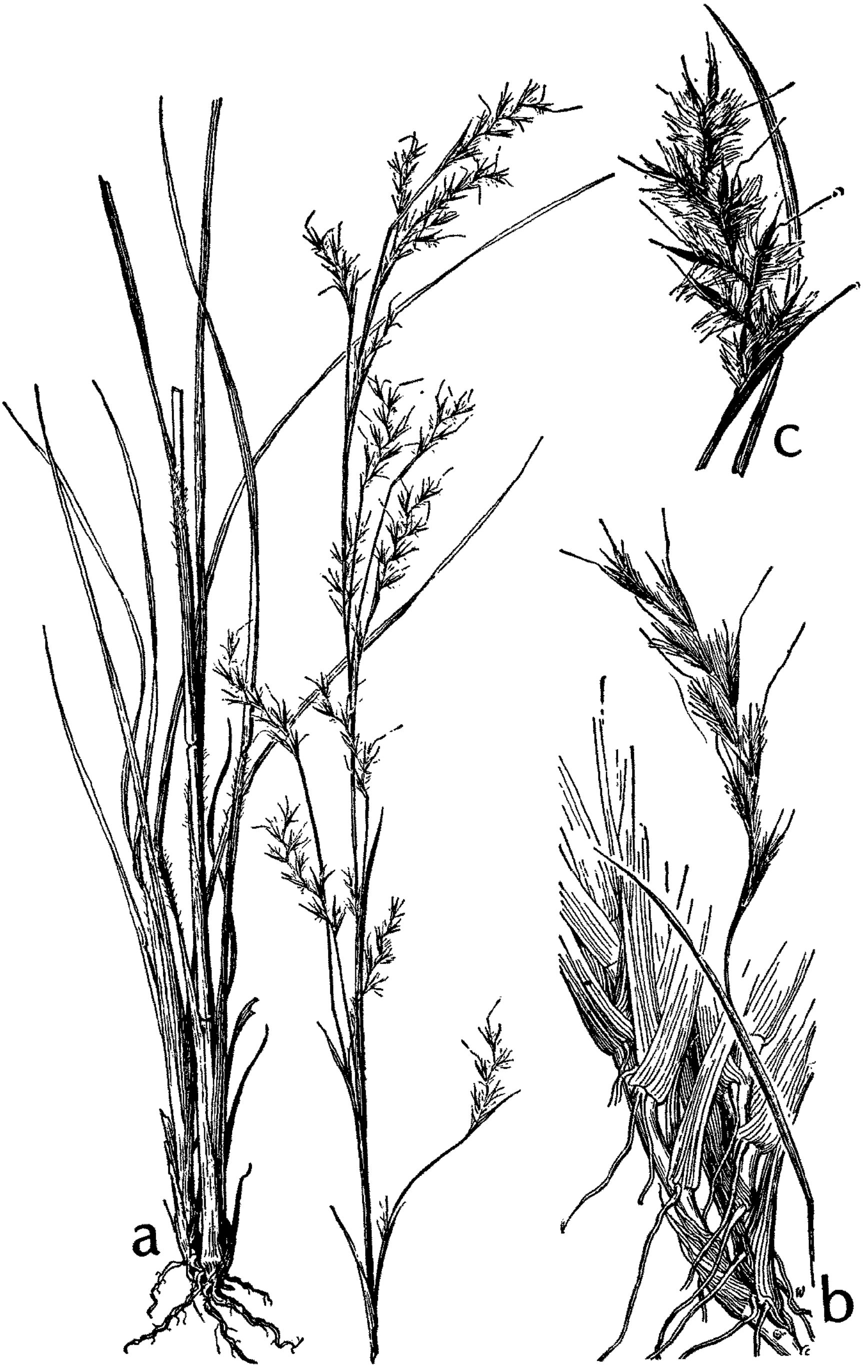

Fig. 94. a, **Schizachyrium scoparium:** plant; b, **Schizachyrium littorale:** base of plant and raceme; c, **Schizachyrium maritimum:** raceme. (From Hitchcock and Chase)

racemes 3–6 cm long, mostly (not always all) with flexuous stalks to about 5 cm long. Sessile spikelet 6–8 (–10) mm long excluding awn; awn of fertile lemma 7–10 (–14) mm long, twisted below; stalked spikelet essentially reduced to one awned glume. (*Andropogon scoparius* Michx.)

Mostly on well-drained sites, old fields, open woods, prairies, sometimes colonizing moist to wet areas of soil disturbance. N.B. and Que. to Alta., s. to n. Fla., Tex. and Ariz.

2. **Schizachyrium littorale** (Nash) Bickn. Fig. 94

Plant tufted, not rhizomatous, usually decumbent below and rooting at the lowermost nodes, usually bluish glaucous, the stems 6–8 dm tall, the inflorescence comprising about the upper half, this loosely fastigiately branched. Lower leaf sheaths strongly compressed-keeled. Ultimate spikelet-bearing branch single, 4–6 cm long, its subtending spathe narrow and inconspicuous, the stalk barely if at all exserted from the spathe. Sessile spikelet 8–10 mm long excluding the awn; awn about 1.5 cm long, with a few spiral twists somewhat above the base then straight. (*Andropogon littoralis* Nash)

Upper strand of sea beaches and on dunes, Mass. to N.C.; s. Tex.; shores of Great Lakes.

3. **Schizachyrium rhizomatum** (Swallen) Gould.

Plant rhizomatous and colonial. Stems 5–8 dm tall. Leaf sheaths rounded or obscurely keeled, the sheaths up to the inflorescence overlapping, rather broad and conspicuous, the blades mostly 5–10 cm long. Spikelet-bearing branch single, 2–4 cm long, scarcely if at all exserted from the subtending sheath, usually conspicuously tortuously curved-zigzagging. Inflorescence little branched. Sessile spikelet 5–7 mm long, excluding the awn; stalked spikelet reduced to an almost awnlike glume; awn of the fertile lemma 5–10 mm long, twisted below. (*Andropogon rhizomatus* Swallen)

Moist sands or pits in limerock of pinelands, wet prairies. S. Fla.

4. **Schizachyrium stoloniferum** Nash.

In general habital appearance much like *S. scoparium* with which it is said to intergrade. Rhizomatous, forming loose tufts. Stems strictly erect, mostly 8–15 dm tall, commonly purplish. Sheaths and leaves glabrous to villous; blades flat, 3–5 mm wide. Spathes mostly very short, sometimes 3–4 cm long. Racemes 2–4 cm long, their axes straight to moderately zigzag, the latter mostly distally. Sessile spikelet 5–7 mm long; awn of fertile lemma 6–10 mm long, twisted below; stalked spikelet usually comprised of an awned glume only. (*Andropogon stolonifer* (Nash) Hitchc.)

Mostly on well-drained sites, longleaf pine–scrub oak hills and ridges, pine savannas and flatwoods; not infrequently abundantly colonizing moist to wet clearings where soils mechanically much disturbed. Coastal plain, Ga., Fla., to Miss.

5. **Schizachyrium maritimum** (Chapm.) Nash. Fig. 94

Plant rhizomatous and colonial, the stems usually arched-ascending, glaucous and reddish, the inflorescence comprising the upper one-third of the stem; stems mostly 5–6 dm tall. Basal leaf sheaths moderately compressed, those above nearly rounded, blades 5–10 cm long. Spikelet-bearing branches 3–6 cm long, their stalks not exserted from the sheaths, or exserted for about 2 cm. Sessile spikelet about 10 mm long, excluding the awn; stalked spikelet comprised of two well-developed glumes. Awn of the sterile lemma about 10 mm long, tightly twisted just at base, then moderately bent-twisted for a short distance, finally straight. (*Andropogon maritimus* Chapm.)

Upper strand of sea beaches, dunes, interdune swales. Coast and offshore islands of the Fla. Panhandle, offshore islands to La.

33. Elyonurus

Elyonurus tripsacoides Humb. & Bonpl. ex Willd. BALSAMSCALE. Fig. 95

Perennial with short-ascending rhizomes or basal offshoots, tuft-forming. Stems hard

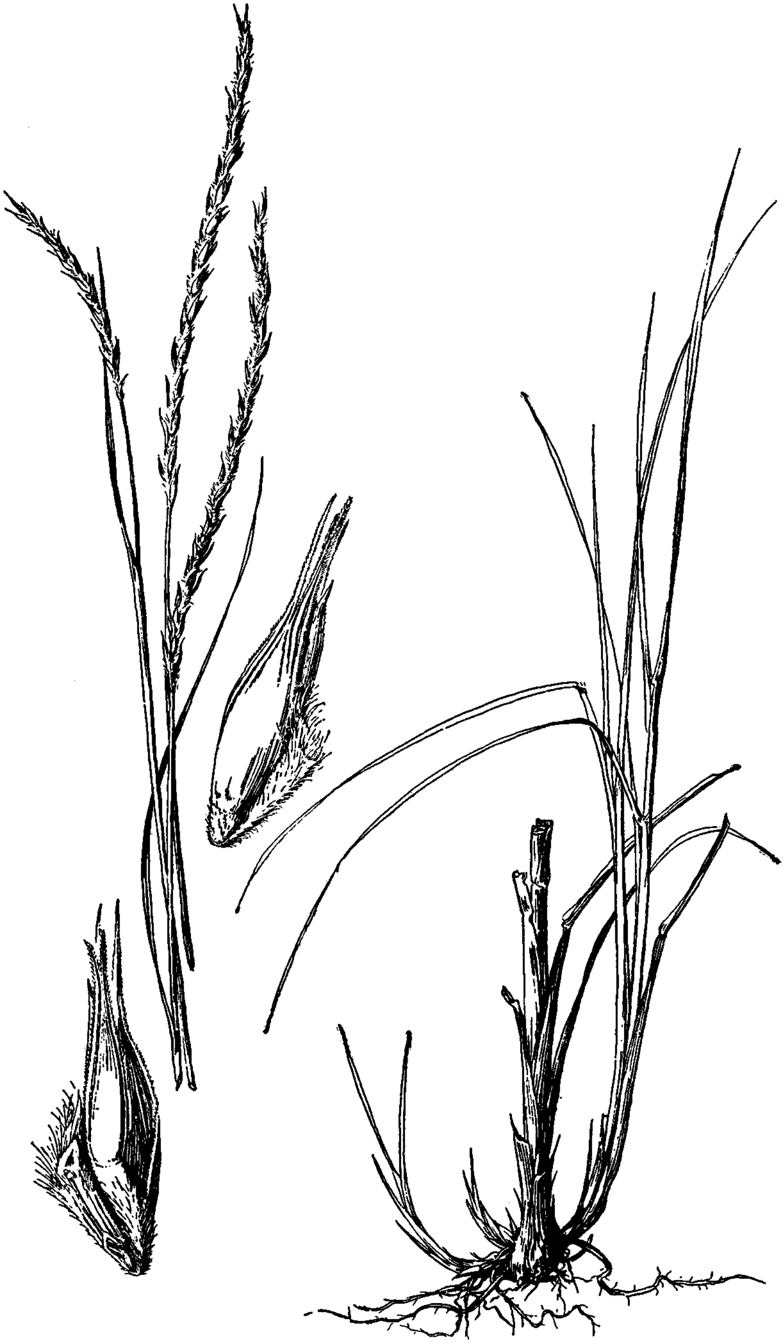

Fig. 95. **Elyonurus tripsacoides:** habit and two views of spikelet with rachis joint. (From Hitchcock and Chase)

and stiff, 6–12 dm tall. Leaf blades flat below, involute distally or involute throughout, elongate, 2–4 mm wide. Inflorescences narrow spikes, 7–15 cm long, on stiff wiry stalks, both lateral and terminal. Spikelets in pairs on a jointed axis, appressed to the axis, one of the pair sessile and bisexual, the other stalked and staminate, the stalk dilated distally; both similar in aspect, neither awned, 5–6 mm long; joints pilose, disarticulating at the nodes, the pair of spikelets falling with a joint. First glume dorsally flat (away from the axis), its margins inflexed around the edges of the second glume; glume apically acute to acuminate, margins scabrid, the tips varyingly ciliate-hispid; on the inflexed margins of the glume a parallelling green nerve bears a gummy line or ridge its full length (best seen from a side view after elevating the glume). Second glume hyaline and thin, 1–3-nerved distally. Lemma very thin-hyaline, palea none.

Pine savannas and flatwoods, low wet prairies, usually in sandy peat or marly soils. Coastal plain, Ga., Fla., Miss., Tex.; Mex. to Argen.

34. Manisuris (JOINTGRASSES)

Perennials, forming basal offshoots, or short-rhizomatous, the stems moderately robust. Inflorescence stalked, thickly jointed cylindric spikes, both axillary and terminal, often not wholly exserted from the sheaths; base of the joints sculptured-out, a fertile spikelet fitting snugly in the hollow, a thickly stalked rudimentary spikelet beside it. First glume very hard and thick, borne on the side away from the axis (its surface character useful in species identification); outwardly this glume is at first flush with the thickened axis on which borne, later it may diverge. (While the character of the surface of the first glume has value in species determination, one should be aware that the particular character ascribed in a given case varies considerably from spikelet to spikelet on the same plant, even on the same spike. It is therefore sometimes desirable to examine a considerable number of glumes in order to establish the pattern of markings.)

Of the species of *Manisuris* here treated we feel comfortable about recognizing *M. rugosa* and *M. cylindrica.* The other two appear to be rare or rarely collected. We include them especially to call attention to them. Others may know them better and have no qualms about recognizing them.

1. Surface of first glume with definitely raised, irregular transverse ridges or partial ridges, these often raised to the point of being like little flaps. 1. *M. rugosa*
1. Surface of first glume otherwise marked or smooth.
  2. First glume smooth or with a few low rounded tubercles. 2. *M. tuberculosa*
  2. First glume pitted or with rectangular depressions.
    3. The first glume pitted, the pits often very shallow, usually more or less in vertical lines, or not pitted but with barely evident shallow vertical channels. 3. *M. cylindrica*
    3. The first glume with rectangular depressions, mostly on the lower half. 4. *M. tessellata*

1. Manisuris rugosa (Nutt.) Kuntze. Fig. 96

Stems 6–12 dm tall, the overall inflorescence usually with numerous lateral spikes, these sometimes not wholly exserted from the sheaths, the spikes 4–8 cm long. The ridging on the surfaces of the first glume is usually evident to the naked eye.

Commonly in shallow water and in depressions where water stands intermittently, sometimes in fairly extensive almost pure stands, in somewhat peaty substrate, depressions in pine savannas and flatwoods, shallow pools, pond margins, cypress-gum ponds, ditches. Mostly coastal plain, Va. to s. Fla., w. to e. and s.e. Tex., Ark.

2. Manisuris tuberculosa Nash. Fig. 96

In general aspect like the preceding. The first glume smooth or with a few low, rounded tubercles or knobs scattered on the surface.

Borders of lakes. C. pen. Fla. and s. Ala.

3. Manisuris cylindrica (Michx.) Kuntze. Fig. 96

Short-rhizomatous. Stems 4–10 dm tall, sometimes with a single terminal spike, mostly

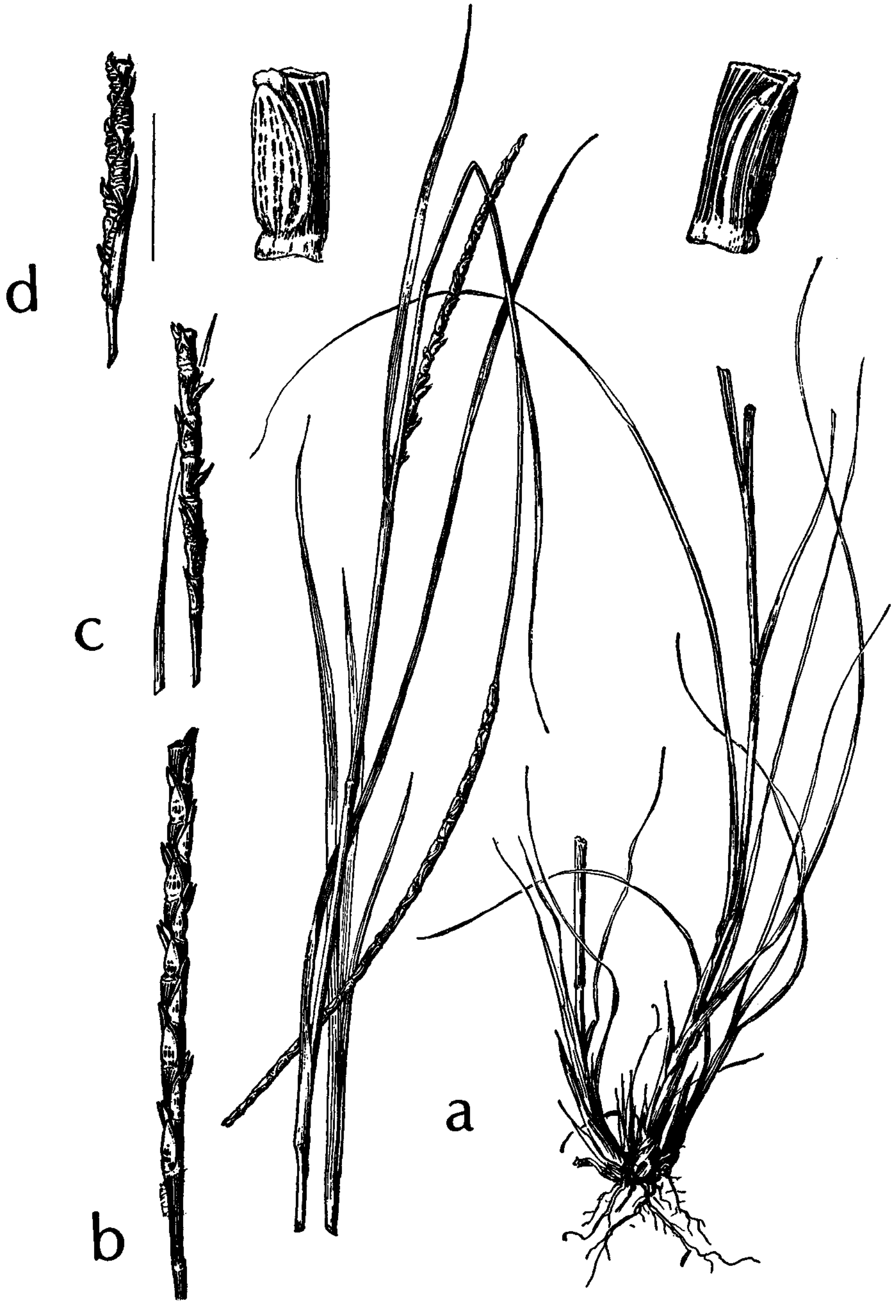

Fig. 96. a, **Manisuris cylindrica:** habit and (above) two views of rachis joint with fertile and sterile spikelets attached; b–d, racemes of: b, **Manisuris tessellata;** c, **Manisuris tuberculosa;** d, **Manisuris rugosa.** (From Hitchcock and Chase)

with a few laterals as well. The stalks of the spike long-exserted from the sheaths, the spikes narrowly cylindrical and sometimes relatively elongate, to about 15 cm long. First glume with roundish small pits, these often very shallow, usually disposed in vertical lines, or not pitted but with shallow barely evident vertical channels.

Moist pine flatwoods, prairies, pond margins. N.C. to n. pen. Fla., w. to Tex., n. to Mo.

4. Manisuris tessellata (Steud.) Scribn. Fig. 96

Similar in general aspect to *M. rugosa.* First glume with rectangular pits on the lower half.

Moist pine flatwoods (probably!). Fla. to La.

35. Eragrostis (LOVEGRASSES)

Annual or perennial, with few exceptions tufted. Sheath commonly pubescent at the summit, blades flat or involute, ligule a ring of short hairs. Inflorescences, various but mostly open and rather loose panicles. Spikelets 3–many-flowered, awnless, usually more or less laterally flattened. Glumes 1-nerved, or second 3-nerved, usually unequal, shorter than the lowest lemmas. Lemmas 3-nerved (the lateral nerves sometimes obscure), keeled or rounded on the back. Disarticulation may be above the glumes, or in some species the axis of the spikelet remains intact, the glumes fall, the grain and lemma deciduous together, the palea remaining on the axis (for a time at least).

1. Plants with surface runners (stolons), flowering stems arising from the nodes of the runners, mat-forming.
  2. Leaf blades subulate, involute; spikelets in capitate clusters or in short close panicles; florets unisexual, staminate and pistillate on separate plants; tips of mature lemmas mostly acuminate and curved outward. 1. *E. reptans*
  2. Leaf blades flat, linear-attenuate; florets bisexual; tips of lemmas mostly acute, straight. 2. *E. hypnoides*
1. Plants tufted, without surface runners.
  3. Spikelets sessile or subsessile, if stalked the stalks little, if any, exceeding 1 mm long. 3. *E. oxylepis*
  3. Spikelets, or some of them, on filiform or capillary stalks.
    4. The spikelets 2–3 mm long.
      5. Panicle and spikelets markedly reddish-purple; plant with short, hard rhizomes, clump-forming. 8. *E. spectabilis*
      5. Panicle and spikelets not reddish purple; plants annual, tufted.
        6. Panicle open, spikelets on diverging capillary stalks and easily discernible to the eye individually, 2 mm long. 4. *E. frankii*
        6. Panicle dense, the branchlets many, spikelets overlapping, extremely numerous, not standing out individually. 5. *E. glomerata*
    4. The spikelets, some on any panicle, 5 mm long or more.
      7. Plant a tufted annual, stems of variable stature, to about 4 dm tall.
        8. Spikelets elongating over a considerable period of time, shedding mature florets below, ovate at any given time and nearly 3 mm wide at base. 6. *E. unioloides*
        8. Spikelets with florets all developing to maturity at about the same time, lower florets not shedding much before the upper, linear or very narrowly oblong, 1 mm wide or slightly more. 7. *E. pectinacea*
      7. Plant a tufted perennial with relatively hard base, stems mostly over 5 dm tall.
        9. Panicle very wide-spreading, about as broad as long.
          10. The panicles and spikelets markedly reddish purple; plant with short, hard rhizomes, forming clumps. 8. *E. spectabilis*
          10. The panicles and spikelets with little if any reddish purple pigment, usually nearly lead-colored; plant tufted, not having short, hard rhizomes.
            11. Lateral spikelets of the branchlets, or some of them, sessile or with stalks not longer than the spikelet length. 9. *E. refracta*
            11. Lateral spikelets of the branchlets all capillary-stalked, most of the stalks much longer than the spikelet length. 10. *E. elliottii*

9. Panicle not very wide-spreading, longer than broad, the branches ascending.
  12. Lemmas about 1 mm long; spikelets about 1 mm wide. 11. *E. bahiensis*
  12. Lemmas 1.5–2.0 mm long; spikelets 1.5–2 mm wide or a little more. 12. *E. atrovirens*

1. **Eragrostis reptans** (Michx.) Nees. Fig. 97

Annual, with surface runners, rooting at some nodes, flowering stems from the nodes, 5–15 cm tall, internodes usually somewhat pubescent. Leaf blades short, 1–2 cm long, involute, subulate, sheaths and blades usually pubescent, often glabrate. Spikelets short-stalked, 6–many-flowered, often curved; staminate and pistillate on separate plants, the pistillate panicles crowded, compact, subcapitate, the staminate looser, with several evident short branches bearing tight clusters of spikelets; lemmas of pistillate spikelets nearly 2 mm long, those of the staminate 3 mm long, apices of both acuminate, scabrous on the keels, at least distally.

Exposed shores of lakes and rivers, oxbows in river floodplains, muddy shores. S.w. Ga., n.w. Fla., to Tex., northward generally to Ky., Ill., and S.Dak.

2. **Eragrostis hypnoides** (Lam.) BSP. Fig. 97

Annual, with surface runners, rooting at some nodes, the flowering stems from the nodes, 5–15 cm tall; nodes pubescent, internodes glabrous. Leaf blades flat, linear-attenuate, mostly 2–3 cm long, sheaths and blades usually pubescent, sometimes glabrous. Panicles open, to about 5 cm long, 1–3 cm broad. Spikelets 6–many-flowered, 3–15 mm long, mostly on capillary stalks 2–4 mm long; lemmas 1.5–2.0 mm long, scabrous on the keel distally, apices acute, straight.

Banks of creeks, shores, exposed bottoms, bars, rivers, shores of ponds and lakes, sloughs, ditches. Que. to Wash., generally southward throughout much of the U.S.; Mex., C.Am., W.I., S.Am.

3. **Eragrostis oxylepis** (Torr.) Torr. RED LOVEGRASS. Fig. 98

Tufted perennial. Stems 2–7 dm tall, glabrous. Leaf blades flat, becoming involute, firm and stiffish, 2–5 mm wide, sheaths pilose inside at the junction with the blade. Panicles erect or often nodding, variously branched but not widely, principal branches naked at base. Spikelets sessile, rarely stalked, disposed interrupted spikelike on the branchlets, more or less suffused with purplish red pigment, 10–many-flowered, variable in length, 5–10 (–20) mm long, 3–5 mm wide; lemmas about 3 mm long, in side view lance-ovate, apices mostly acuminate, scabrous on the keels distally.

Mostly in well-drained sandy soils of open woods, sand dunes, prairies; also interdune swales, river sand bars, shores of estuaries and bayous, ditches. N. Fla. to Tenn., w. to Kan., Colo., N.Mex.; s. Calif.; Mex.

4. **Eragrostis frankii** C. A. Meyer ex Steud. Fig. 98

Slender tufted annual. Stems 1–4 dm tall, glabrous. Leaf blades soft, linear-attenuate, to 2 dm long, 1–4 mm wide, finely scabrous marginally, pilose on inside at junction of sheath and blade. Panicle open and diffuse, much longer than broad. Spikelets 2 mm long, on diverging capillary stalks 2–8 mm long, 2–6-flowered; lemmas ovate, apically acuminate, a little over 1 mm long, the keels finely scabrid distally.

Shallow seasonally wet soils on rock outcrops, sand bars, river banks, moist open places. N.H. to Minn., generally southward to Fla., Okla. and Ark.

5. **Eragrostis glomerata** (Walt.) L. H. Dewey. Fig. 98

Annual. Stems branched below, mostly 6–10 dm tall, glabrous. Panicles long and narrow, loose but dense, with extremely numerous spikelets on ascending branches and branchlets floriferous to the base. Spikelets stalked, mostly 6–8-flowered and about 3 mm long; lemmas lanceolate seen in side view, acute, apically glabrous, 1 mm long or slightly more.

Exposed river banks and bars, floodplain forests, shores and banks of bayous, ditches. Fla. Panhandle to e. Tex.; n. to Tenn., Ark. and Mo.

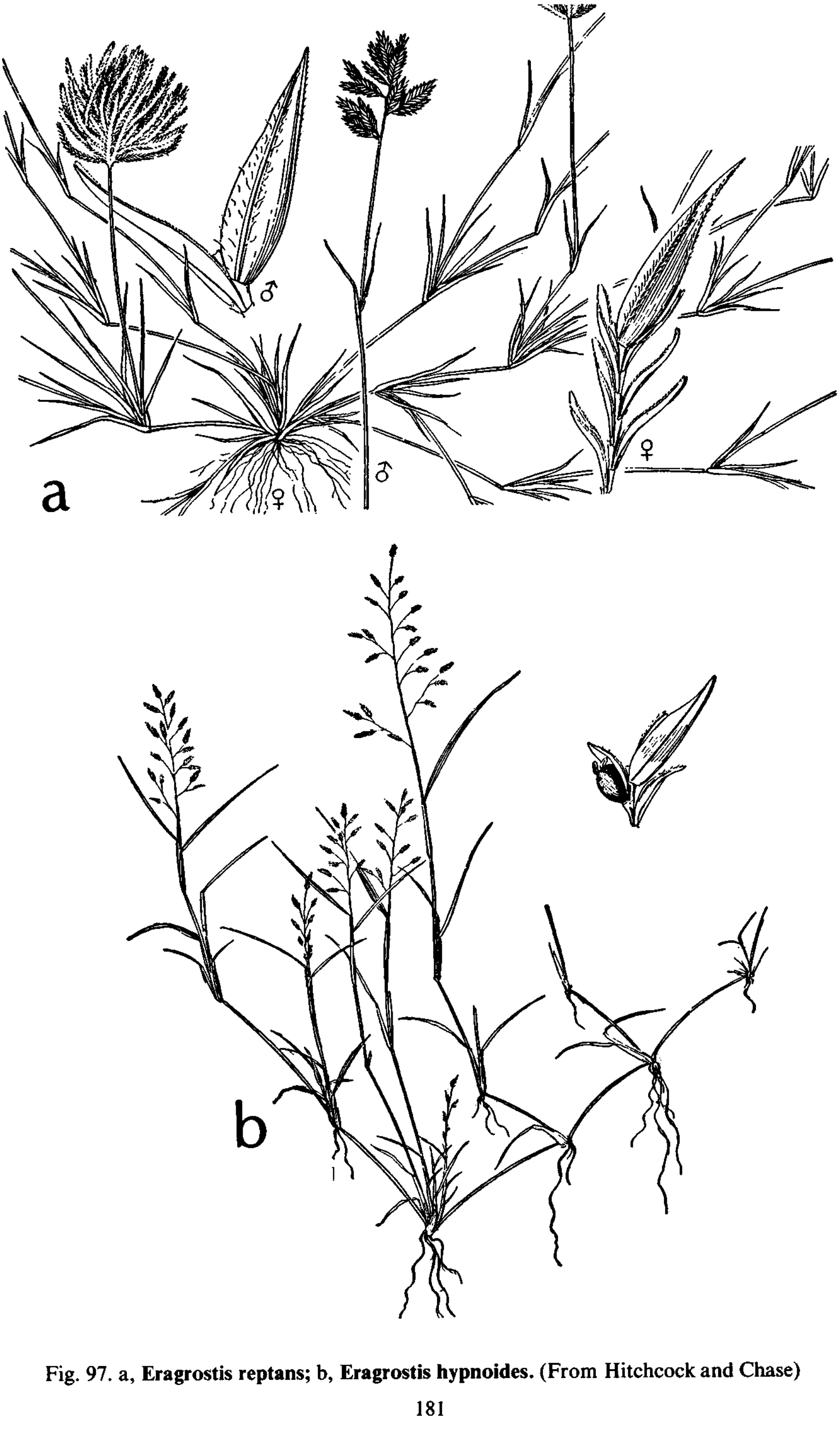

Fig. 97. a, **Eragrostis reptans**; b, **Eragrostis hypnoides.** (From Hitchcock and Chase)

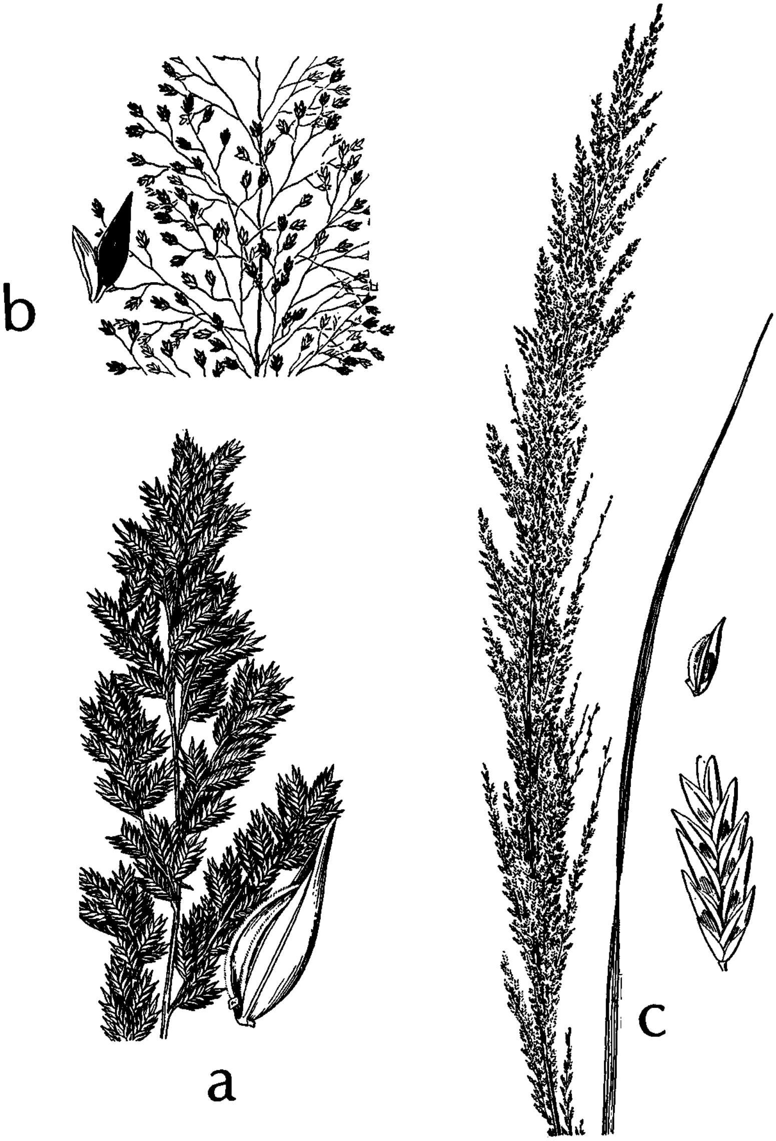

Fig. 98. a, **Eragrostis oxylepis:** portion of panicle and floret; b, **Eragrostis frankii:** portion of panicle and floret; c, **Eragrostis glomerata:** portion of panicle, spikelet and floret. (From Hitchcock and Chase)

6. **Eragrostis unioloides** (Retz.) Nees ex Steud.

Annual, stems solitary with several to numerous branches from near the base, or somewhat tufted. Leaf blades flat, 3–8 cm long, 2–6 mm wide, smooth, sheaths ciliate on the sides at the summit. Panicles open, branches diverging, usually longer than broad; spikelets at first short-ovate, elongating over a considerable period, to 1 cm long or a little longer, the lower florets maturing and falling, continuing gradually upward as elongation occurs, the intact part of the spikelet at any given time being ovate, about 3 mm wide basally, obtuse apically, at maturity usually pinkish or roseate; lemmas broadly boatlike, at maturity extending outward nearly at right angles to the axis, closely overlapping, about 2 mm long fully developed, short-acuminate apically, the keels finely scabrid distally.

Borders of swamps and wet hammocks, floodplain woodlands, alluvium of stream shores, sometimes in shallow water. Introduced from southern Asia, sporadically naturalized, Ga., and Fla.

7. **Eragrostis pectinacea** (Michx.) Nees.

Slender annual, solitary with several to numerous branches from near the base or somewhat tufted, 1–6 dm tall, glabrous. Leaf blades flat or involute, to about 1 dm long, 0.5–4 mm wide, linear-attenuate, pilose on the auricles at junction of sheath and blade. Panicles open, usually diffuse, the branches relatively distant, spreading to ascending, capillary, variable in overall size, 4–15 cm long, 2–6 cm wide at the base. Spikelets disposed throughout the length of the branches or mostly on their distal portions, sessile or stalked, variable in length and number of florets, 3–10 mm and 2–12 mm respectively; lemmas ovate viewed from the side, apically acute, obtuse or somewhat acuminate, more or less suffused with purple pigment, scabrous on the keels distally, 1.0–2.0 mm long or a little more.

Sand and gravel of exposed shores, bars of rivers, oxbows, in shallow water and mud of bottomland clearings, shores of creeks and ponds, weedy in various moist to wet disturbed sites. Maine to N.Dak., generally southward to Fla. and Tex.

8. **Eragrostis spectabilis** (Pursh) Steud. TUMBLE-GRASS. Fig. 99

Perennial, with short, hard rhizomes, clump-forming. Stem 4–8 dm tall, rigid, panicles comprising most of the stem, usually about as wide as long. Leaf sheaths glabrous or pilose, densely pubescent at the throat, blades 2–5 mm wide. Panicle and spikelets conspicuously reddish purple, branches stiffly divergent, often the lower reflexed, usually pilose in the axils. Spikelets 3–15-flowered, 3–10 mm long, 1.5–2.0 mm wide, on stiff stalks.

Usually on well-drained sites but sometimes locally abundant in boggy-mucky open places. Maine to Minn.; generally southward to Fla. and Ariz.; Mex.

9. **Eragrostis refracta** (Muhl.) Scribn. Fig. 100

Tufted perennial. Stems 5–8 dm tall, glabrous. Leaf blades flat or involute distally, strongly striate, linear-attenuate, 2–8 mm wide, sheaths glabrous to sparingly pilose, sometimes especially so marginally, the blades scabrous on the upper surface, sometimes also with sparse pilosity especially near the base, hirsute at junction of sheath and blade. Panicles very broad, open and diffuse, generally about as wide as long, the branches filiform, flexuous, pilose in the axils. Spikelets on the ultimate branchlets relatively distant to somewhat over-lapping, the lateral ones sessile or with stalks shorter than the spikelet length, appressed-ascending; linear, 6–25-flowered, mostly 6–12 mm long, more or less lead-colored to the naked eye; lemmas seen in side view ovate-acuminate, about 2 mm long, grayish, more or less suffused with purplish pigment, finely scabrous on the keels distally, marginally hyaline or scarious.

Tolerant of a fairly wide range of moisture conditions, well-drained to poorly drained pinelands, pine savannas, sandy river banks, hillside bogs, exposed shores of ponds or lakes, sometimes in shallow water of river marshes, moist to wet clearings. Coastal plain and piedmont, Del. and Md. to s. Fla., w. to Ark. and e. and s.e. Tex.

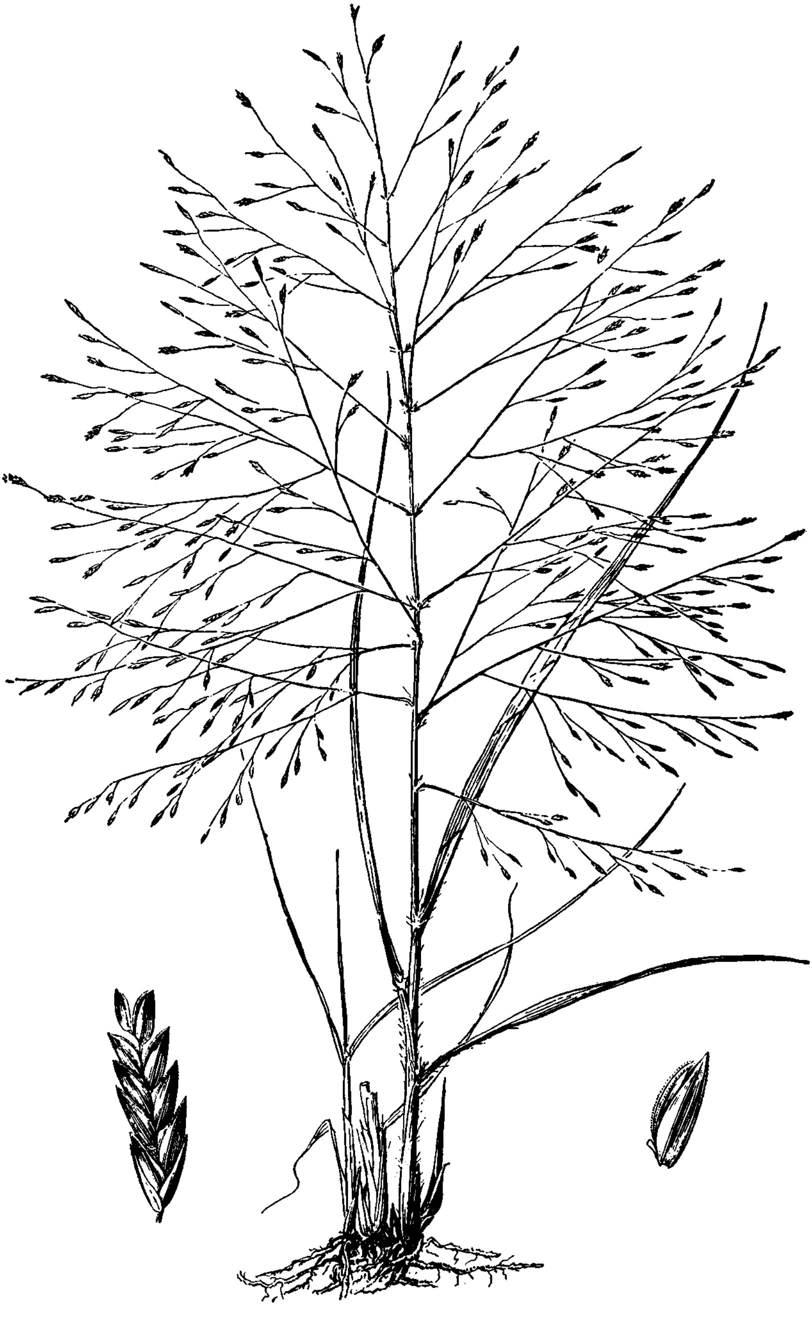

Fig. 99. **Eragrostis spectabilis:** habit, spikelet, and floret. (From Hitchcock and Chase)

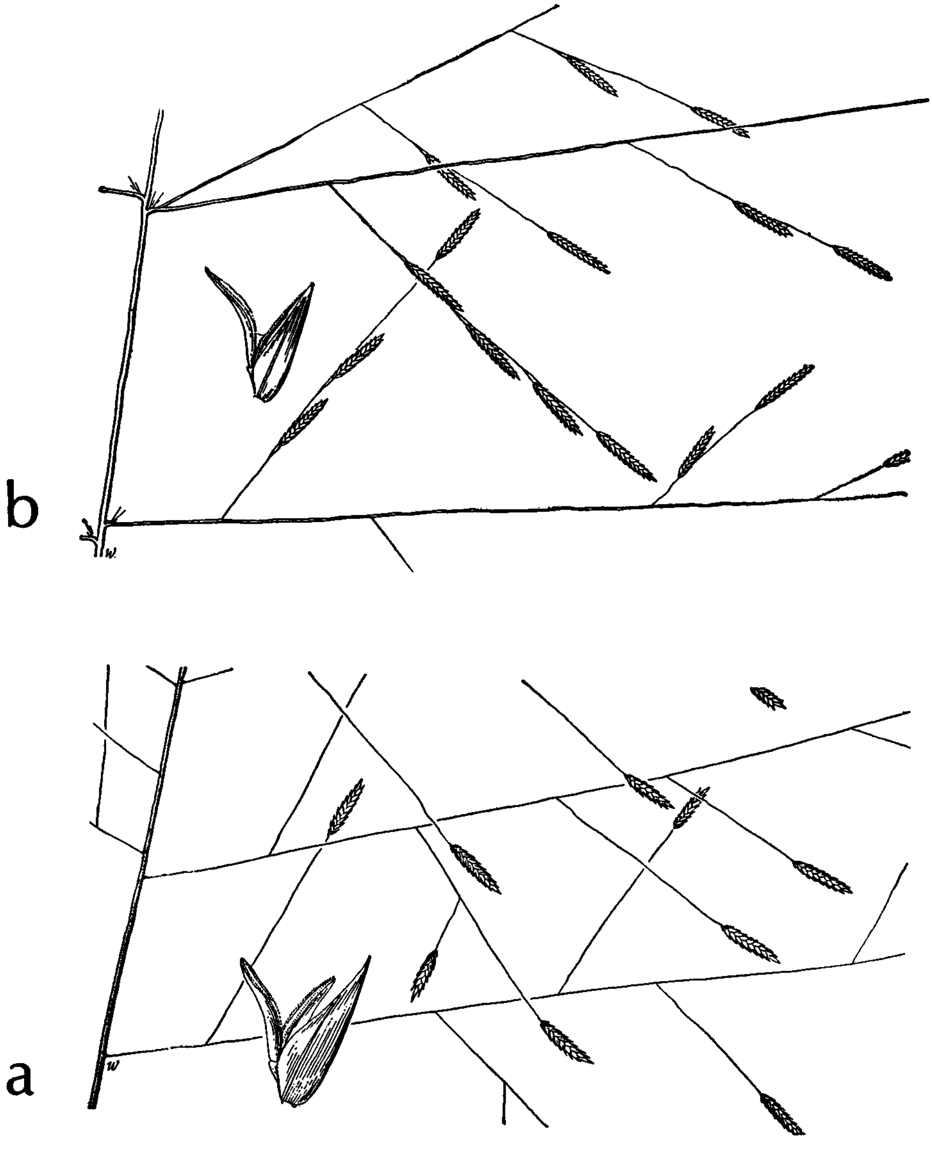

Fig. 100. Portion of panicle and floret of: a, **Eragrostis refracta**; b, **Eragrostis elliottii.**
(From Hitchcock and Chase)

10. Eragrostis elliottii S. Wats. Fig. 100

In general aspect somewhat similar to the preceding. Leaf sheaths smooth and shiny except for pilosity at junction of sheath and blade, the blades flat or involute, more often and more involute than in the preceding, finely scabrous on the upper surface, not pilose, narrowly linear-attenuate, rather stiffly ascending. Panicles very broad, open and diffuse, all or nearly all the spikelets disposed on long spreading capillary stalks, more or less lead-colored to the naked eye. Spikelets linear, mostly 6–15-flowered, to about 10 mm long, mostly 6–8 mm; lemmas viewed from the side ovate-acuminate, often suffused with a little purplish pigment, about 2 mm long, keel scabrous near the tip.

Exposed shores of estuaries, ponds, lakes, in shallow water of marshy shores, dried up bottoms of cypress-gum ponds or on their margins, moist to wet clearings, interdune swales, pineland savannas and flatwoods, ditches; also in well-drained sands of pinelands or pine-hardwood stands. Coastal plain, N.C. to s. Fla.; w. to s.e. Tex.; W.I., e. Mex.

11. Eragrostis bahiensis Schrad.

Tufted perennial. Stems slender-wiry, mostly 6 dm tall or a little more, glabrous. Leaf blades flat or involute, linear-subulate, relatively short, to about 10 cm long, scabrous on the upper surface, sparsely pilose along the margins, more densely so near the junction of sheath and blade. Panicle loose, mostly longer than broad, the principal branches naked basally, filiform-flexuous, the branchlets rather heavily floriferous. Spikelets mostly about 10 mm long, linear, 1 mm wide or slightly wider, stalks nearly smooth, somewhat dilated distally, usually much overlapping, the lower florets maturing and falling as the upper ones develop (the paleas persistent on the axis for a time); lemmas about 1 mm long, keeled to rounded on the back, elliptic seen in side view, short-acuminate apically, smooth, grayish, straw-colored, or roseate purplish.

Flatwoods, floodplains, pond margins, borrow pits, marl prairies. Native of S.Am., sporadically naturalized, Fla. to La.

12. Eragrostis atrovirens (Desf.) Trin. ex Steud.

Tufted perennial. Stems stiff below, with rather hard bases, glabrous, 6–8 dm tall. Leaf blades flat or involute, narrowly linear-attenuate, varying in length, to 2 dm long, upper surface finely scabrous, very sparsely if at all pilose except at or near the junction of sheath and blade. Panicle longer than broad, loose and rather open, the principal branches relatively distant, filiform-flexuous, naked below. Spikelets mostly 10–15 mm long, linear, mostly 1.5–2.0 mm wide, lower florets maturing and falling early (the paleas persistent on the axis for a time), spikelet stalks dilated at the summit; lemmas mostly lead-colored, ovate and short-acuminate seen in side view, about 2 mm long, smooth or the keels very shallowly blunt-toothed distally.

Pine flatwoods, exposed shores of ponds, lakes, streams, banks or borders of sloughs, ditches, marshes, disturbed places. Native in Afr. and Asia, widely naturalized in Fla., perhaps elsewhere in our range. (*E. chariis* sensu Hitchcock & Chase, 1950, *E. nutans* sensu Long & Lakela, 1971.)

36. Tridens (SANDGRASSES)

Perennials, tufted or rhizomatous. Panicles terminal, much exceeding the leaves, open or condensed-spikelike. Spikelets 3–10-flowered; glumes unequal to subequal, the second usually as long as the lower lemma, in one species as long as the spikelet; lemmas closely overlapping, broad, rounded on the back, the central or all three nerves excurrent as a mucro apically, long-pubescent at least on the lower half of the nerves. Disarticulation is above the glumes and between the florets.

- Panicles loose and open; glumes not exceeding the lower lemmas. 1. *T. ambiguus*
- Panicle dense and spikelike; glumes exceeding the lower lemmas. 2. *T. strictus*

1. Tridens ambiguus (Ell.) Schult. Fig. 101

Usually tufted, perennating by basal offshoots or rarely with slender scaly rhizomes. Stems mostly 6–10 dm tall, the panicle much exceeding the leaves, glabrous, internodes green, nodes purple; basally usually more or less fibrous with persistent old leaf bases; leaf sheaths glabrous except at the pilose summit; blades narrow, 1–5 mm wide, striate, flat or involute, glabrous or the margins finely scabrid; ligule a ring of cilia. Panicle open, 6–15 cm long, branches slenderly wiry, stiffly ascending. Spikelets closely ascending, all sessile or sessile and stalked, of varying lengths up to 5 mm; mostly 4–8-flowered, flattish, ovate-oblong, 4–8 mm long, nearly as wide basally, obtuse apically, usually reddish purple, rarely straw-colored; glumes keeled, 1-nerved, chartaceous, the margins smooth, first a little shorter and narrower than the second, second equalling the lowest floret; lemmas ovate-oblong, rounded on the back, apically rounded and mucronate, lateral nerves with a brush of long yellowish or brownish appressed hairs on the lower halves. (*Triodia elliottii* Bush)

Wet pine savannas and flatwoods, exposed shores of ponds, boggy areas. Coastal plain, S.C. to Fla., w. to e. Tex.

2. Tridens strictus (Nutt.) Nash. Fig. 101

Tufted short-rhizomatous perennial. Stems mostly 1–1.5 dm tall, basally with fibrous tufts of old leaf bases, glabrous. Leaf sheaths smooth or ciliate on the margins, the blades sparsely pilose basally, 2–8 mm wide, rigid, flat or involute, margins minutely scabrid; ligule a ring of cilia. Panicle dense and spikelike, pale to purplish, 1–3 dm long, 1–2 cm broad. Spikelets flattish, 4–10-flowered, 4–6 mm long, 3.5–4.5 mm wide; glumes subequal, 1-nerved, keeled, glabrous, mucronate apically, longer than the lower lemmas to as long as the spikelet; lemmas ovate, long-pubescent on the three nerves below, the midnerve and sometimes the laterals excurrent as a mucro. (*Triodia stricta* (Nutt.) Benth.)

Moist to wet prairies, pine savannas, pond, lake and stream margins, open low wet places. N.C. to Ala. and Tex., northward to Kans., Ill.

37. Calamovilfa

Rather tall and coarse rhizomatous perennials. Panicles broad and open or relatively narrow and loose. Spikelets 1-flowered, awnless. Glumes unequal, second longer, 1-nerved, the second about as long as the lemma or slightly longer. Lemma firm but not thick, 1-nerved, rounded on the back; bearded on the callused base of the floret, the hairs of the callus from ¼ to nearly as long as the lemma. Coat of grain free from the ovary wall as in *Sporobolus*. Disarticulation is above the glumes.

- Panicle pyramidal, open and loose, the branches spreading-ascending. 1. *C. brevipilis*
- Panicle long and narrow, the branches erect. 2. *C. curtissii*

1. Calamovilfa brevipilis (Torr.) Scribn. in Hack. Fig. 102

Stems from a short stout rhizome clothed with hard persistent sheathing bases of foliage leaves of other seasons; stems 1–1.5 m tall, hard, erect. Leaf blades stiffish, to 5 dm long, 2–5 mm wide, a line of articulation across the back of leaf at junction of sheath and blade. Panicle loose and open, relatively diffuse, 8–40 cm long, 4–20 cm broad, the branches filiform, spreading-ascending. Spikelets 4–6 mm long, linear- or lance-oblong, on capillary stalks; glumes very unequal, first ovate, half as long as the spikelet, apically short-acuminate, second as long as the spikelet or nearly so, ovate and long-acute apically, both short-pubescent near the tip; lemma silky pubescent along the back; callus hairs fairly abundant, ¼–½ as long as the lemma.

Pine savannas, pine barrens, open bogs, edges of swamps and shrub bogs. Coastal plain, N.J. to S.C.

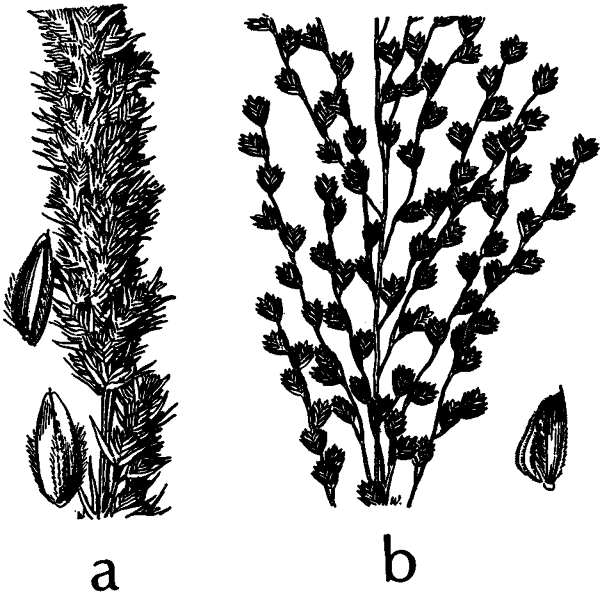

Fig. 101. a, **Tridens strictus:** portion of panicle and floret (two views); b, **Tridens ambiguus:** portion of panicle and floret. (From Hitchcock and Chase)

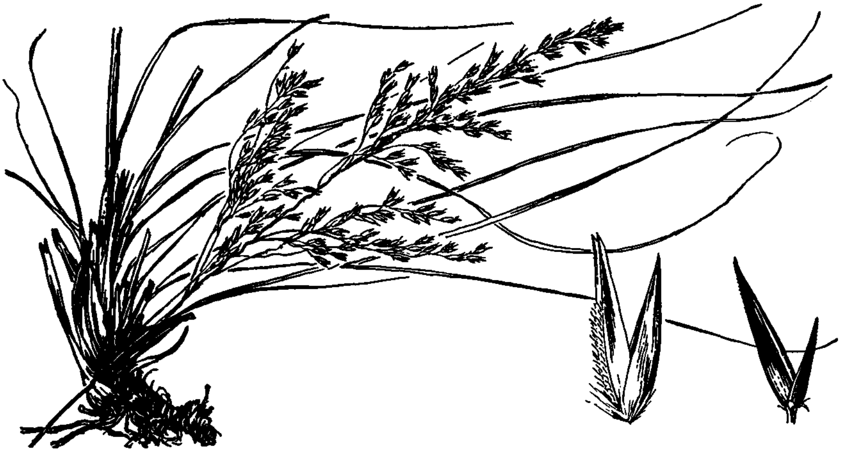

Fig. 102. **Calamovilfa brevipilis:** plant, glumes and floret. (From Hitchcock and Chase)

2. Calamovilfa curtissii (Vasey) Scribn.

Similar in vegetative aspects to the preceding but the panicle narrowly elongate, its branches erect, rather compact but not dense. Spikelets mostly about 4–5 mm long, lanceolate; glumes variable in length from about ½ as long as the spikelet to nearly as long, not as unequal as in the preceding, widest basally, tapering to a long-acute apex, somewhat scabrid on the keel distally; lemmas sparsely to abundantly pilose on the back; callus hairs relatively few.

Pine savannas and flatwoods, in a few widely separated places, n. Fla.

38. Muhlenbergia (MUHLY)

Perennial (ours), tufted or rhizomatous. Inflorescence an open, loose panicle or narrow and spikelike. Spikelets 1(–2) flowered; glumes thin, obtuse to acuminate or awned; lemma narrow, membranous to firm, apically acute to awned; the awn in some from between the teeth of a bifid apex. Disarticulation is above the glumes.

1. Inflorescence a loose and open panicle, the panicle branches capillary; mostly more than 10 cm broad; spikelets on capillary stalks much longer than the spikelets; plants tufted, leaf blades stiff and wiry, involute.
  2. Lemmas awned, the awns mostly 6–20 mm long, rarely 3–5 mm long; inflorescence purple. 1. *M. capillaris*
  2. Lemmas not awned, or with an awn rarely exceeding 1 mm long; inflorescence green to straw-colored or brown. 2. *M. expansa*
1. Inflorescence a contracted or relatively congested somewhat spiciform panicle less than 5 cm broad; spikelets on short stalks little if any exceeding the length of the spikelets; plants decumbent and rooting at the lower nodes or rhizomatous, the stems lax, reclining or sprawling, or erect and freely branched; leaf blades lax, flat.
  3. Plants not rhizomatous, with numerous decumbent branches, rooting at the lower nodes; glumes minute, 0.5 mm long or less. 3. *M. schreberi*
  3. Plants with slender rhizomes, the stems erect to sprawling; glumes 2 mm long or more.
    4. Stems mostly erect, unbranched or sparingly branched; inflorescence above the uppermost leaf of a main stem or branch. 4. *M. glomerata*
    4. Stems moderately to profusely branched near the middle, weak and often reclining, or top-heavy and falling over; panicles terminal and axillary.
      5. Stems glabrous. 5. *M. frondosa*
      5. Stems pubescent in a zone below the nodes. 6. *M. sylvatica*

1. Muhlenbergia capillaris (Lam.) Trin. GULF MUHLY. Fig. 103

Tufted perennial. Stems unbranched, to about 12 dm tall, glabrous or minutely pubescent, wiry. Leaves mostly near the base, blades stiff, sometimes flat, usually involute, 1–4 dm long, 1 (–3) mm wide. Panicle very open and diffuse, to 5 dm long and to 2 dm broad, the branches capillary; usually purple, rarely yellowish. Spikelets on capillary stalks of varying lengths to about 1.5 cm long, narrowly lanceolate and long-pointed; glumes very variable, their apices acute, long-acute, acuminate, or awned, the awns sometimes much exceeding the body of the lemma; lemmas apically acute or acuminate, often bifid, with awns (3–) 6–20 mm long. (*M. filipes* M. A. Curtis)

Pine savannas and flatwoods, interdune swales, stabilized dunes, hillside bogs, limerock pinelands, on sandy or marly spoil, to some extent on well-drained pine-oak ridges. Mass. to Ind. and Kans., southward generally to s. Fla., e. and s.e. Tex.; s.e. Mex., W.I.

2. Muhlenbergia expansa (DC.) Trin. Fig. 104

In overall aspect very much resembling the preceding but without the strikingly purple inflorescence and lacking the "hairgrass" quality given by the awns. Panicle maturing straw-colored, brown, or bronze. Spikelets similar to those of the preceding but the glumes not ever awned, the lemmas not awned or with awns scarcely if at all exceeding 1 mm long.

Pine savannas and flatwoods, bogs. Coastal plain, s.e. Va. to n. Fla., w. to e. Tex.

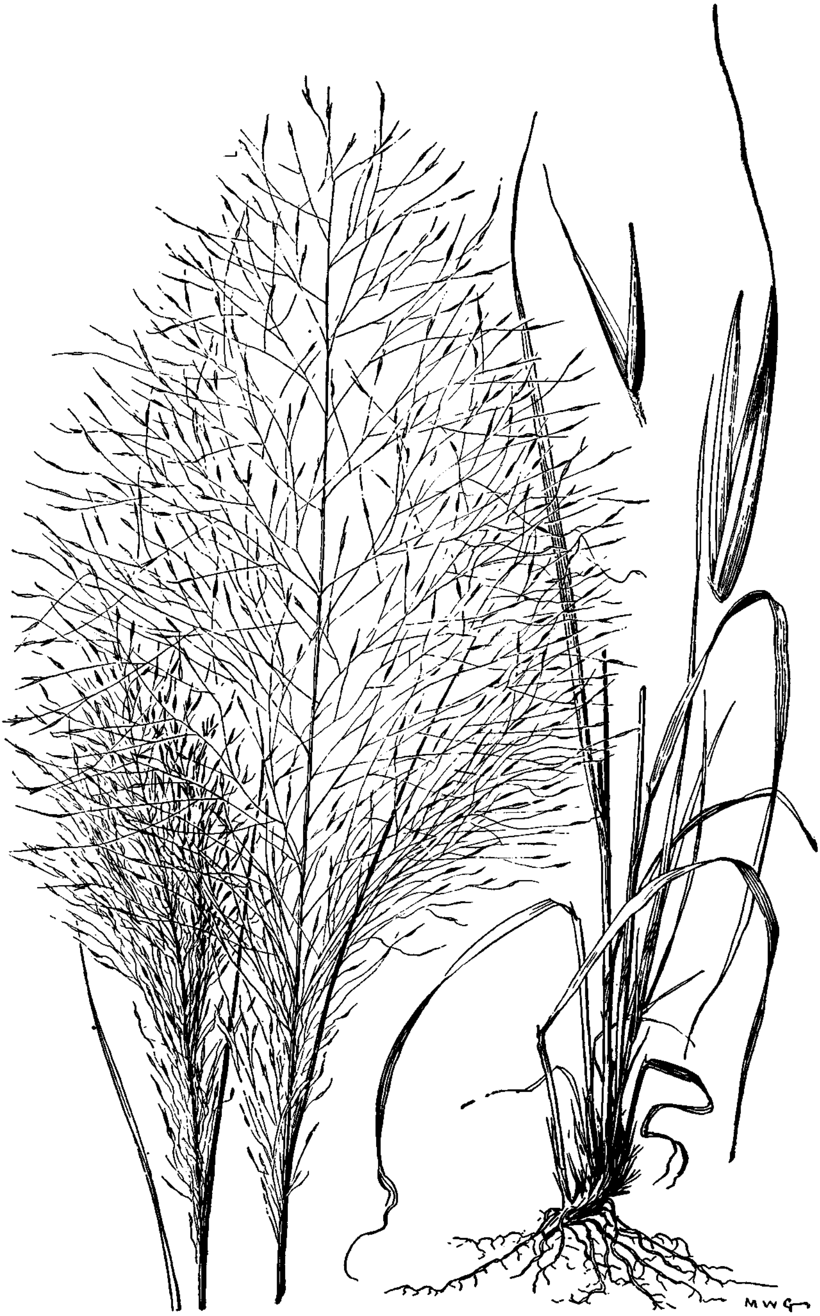

Fig. 103. **Muhlenbergia capillaris:** habit, glumes and floret. (From Hitchcock and Chase)

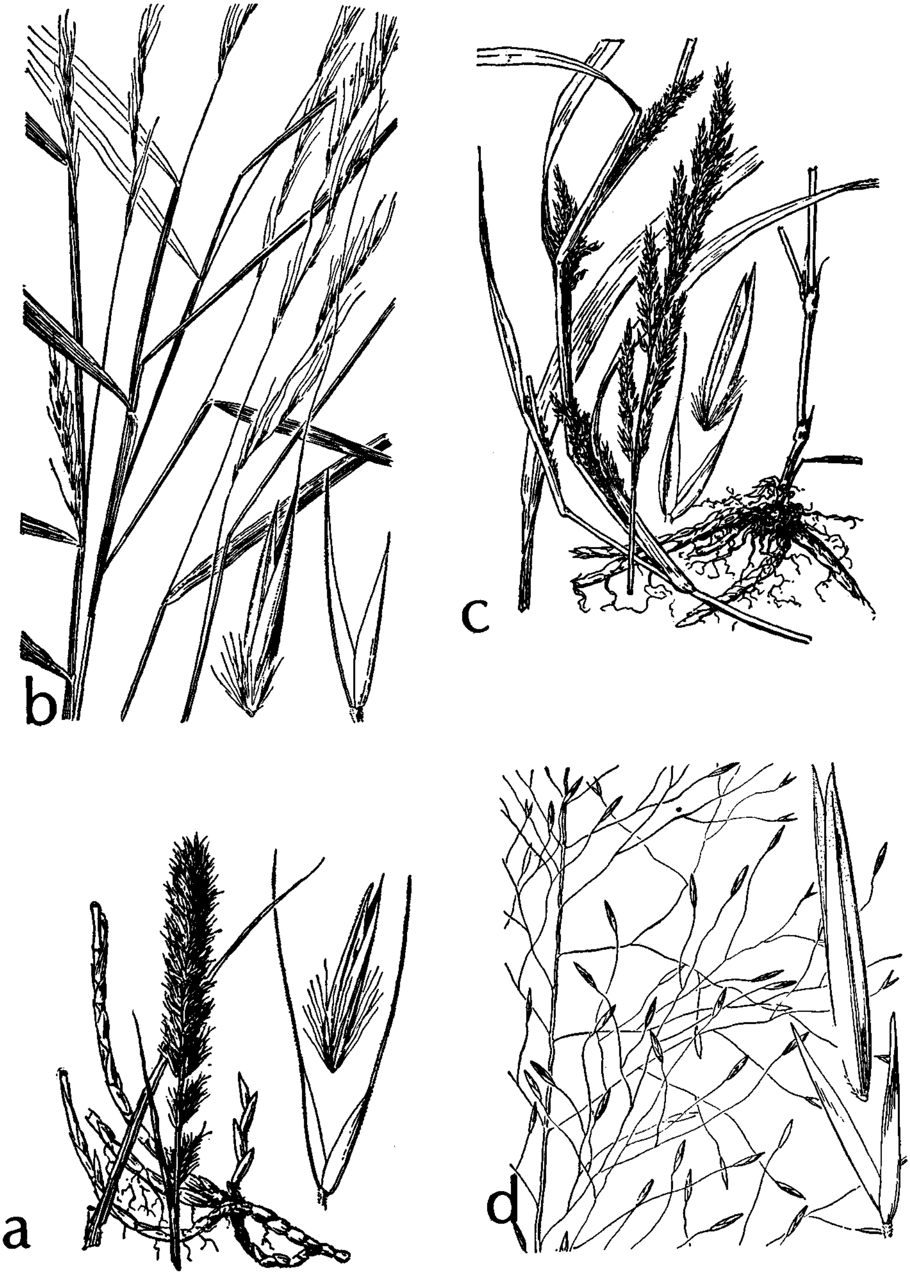

Fig. 104. a, **Muhlenbergia glomerata:** portion of plant, glumes and floret; b, **Muhlenbergia sylvatica:** portion of panicle, floret and glumes; c, **Muhlenbergia frondosa:** portions of plant, glumes and floret; d, **Muhlenbergia expansa:** portion of panicle, glumes and floret. (From Hitchcock and Chase)

3. **Muhlenbergia schreberi** Gmel. NIMBLEWILL. Fig. 105

Not rhizomatous but usually colonial. Stems slender, glabrous, decumbent below and rooting at the nodes, the ascending stems weak, freely branched, bearing panicles laterally and terminally. Leaf blades flat, striate, the principal striations whitish, marginally finely scabrid, sheaths pubescent on the upper side at the summit. Panicles narrow, variable in length, to about 2 dm long, the short spikelet-bearing branches loosely appressed-ascending. Spikelets narrowly lanceolate, 2 mm long, excluding awns; glumes minute, hyaline; lemmas 3-nerved, tapering to an awn 2–5 mm long.

Floodplain forests, river banks, exposed alluvium along rivers and streams, pond margins, limestone ledges, moist open woodlands, in clearings and on shady roadsides. N.H. to Wis. and e. Nebr.; generally southward to Fla. and Tex.; e. Mex.

4. **Muhlenbergia glomerata** (Willd.) Trin. Fig. 104

Plant with slender scaly rhizomes. Stems erect, relatively lax, 3–9 dm tall, unbranched or sparingly branched, sometimes arching below and rooting at the nodes; internodes minutely pubescent. Leaf blades flat, striate, to about 15 cm long, 2–5 mm wide, surficially minutely scabrid. Panicles with relatively short ascending-spreading branches, these compactly spikelet bearing to the base, overall with a lobed-spiciform aspect. Spikelets lanceolate, 5–6.5 mm long, including the awns; glumes about equal, 1-nerved, the sides hyaline, the body as long as the lemma, gradually tapered to an awn about 2 mm long, this extending beyond the lemmas; lemmas pointed, not awned, pilose basally.

Bogs, peaty meadows, seepage areas about rock outcrops, shores, meadows, in widely separated places. Nfld. to s. Ont., and B.C., Wash., n.e. Oreg.; s. to mts. of Va. (and in s.w. N.C.), w. to Nebr.

5. **Muhlenbergia frondosa** (Poir.) Fern. WIRESTEM MUHLY. Fig. 104

Plant with slender scaly rhizomes. Stems glabrous, leafy, geniculately much branched and bushy near the middle, becoming top-heavy and falling over. Leaf blades flat, striate, to 15 cm long, 3–5 mm wide. Panicles numerous, terminal and axillary, partly included in the sheaths or some exserted; rather loose, the very short spikelet-bearing branches appressed-ascending. Spikelets lanceolate, 2.5–3.5 mm long; glumes 1-nerved, the sides hyaline, keels toothed, gradually tapered to a subulate awnlike tip, this not quite reaching the tip of the lemma; lemma pilose basally.

Floodplain woodlands, meadows, alluvial bars, thickets, shores, clearings, waste places. N.S. and Que. to N.Dak., s. in the East to N.C., n. Ga., Tenn., Mo., s. from N.Dak. to n. cen. Tex.

6. **Muhlenbergia sylvatica** (Torr.) Torr. ex Gray. Fig. 104

Plant with slender scaly rhizomes. Stem pubescent in a zone just below the nodes, branched near the middle, weak, often reclining. Leaf blades flat, lax, mostly 8–15 cm long, 2–8 mm wide. Panicles terminal and axillary, narrow, most exserted from the sheaths. Spikelets loosely disposed on short appressed-ascending branches, some of the branches without spikelets near the base. Spikelets lanceolate, 3–4 mm long excluding awns; glumes 1-nerved, the sides hyaline, unequal, the second about equalling or slightly longer than the body of the lemma, narrowed gradually to an acuminate or bristled tip; lemma pilose basally, tapered to an awn 5–10 mm long.

Stream banks, bottomland woods, wet meadows, damp thickets. Que. to s. Ont., Minn., and S.Dak., generally southward to N.C., Ala., Ark., and Tex.

39. Sporobolus (DROPSEEDS)

Perennials (ours), tufted, except one. Inflorescence an open or congested panicle. Spikelets 1-flowered, awnless. Grain usually falling free from the lemma and palea, its outer coat (ovary wall) easily detached from the remainder of the grain when water-soaked. Disarticulation is above the glumes.

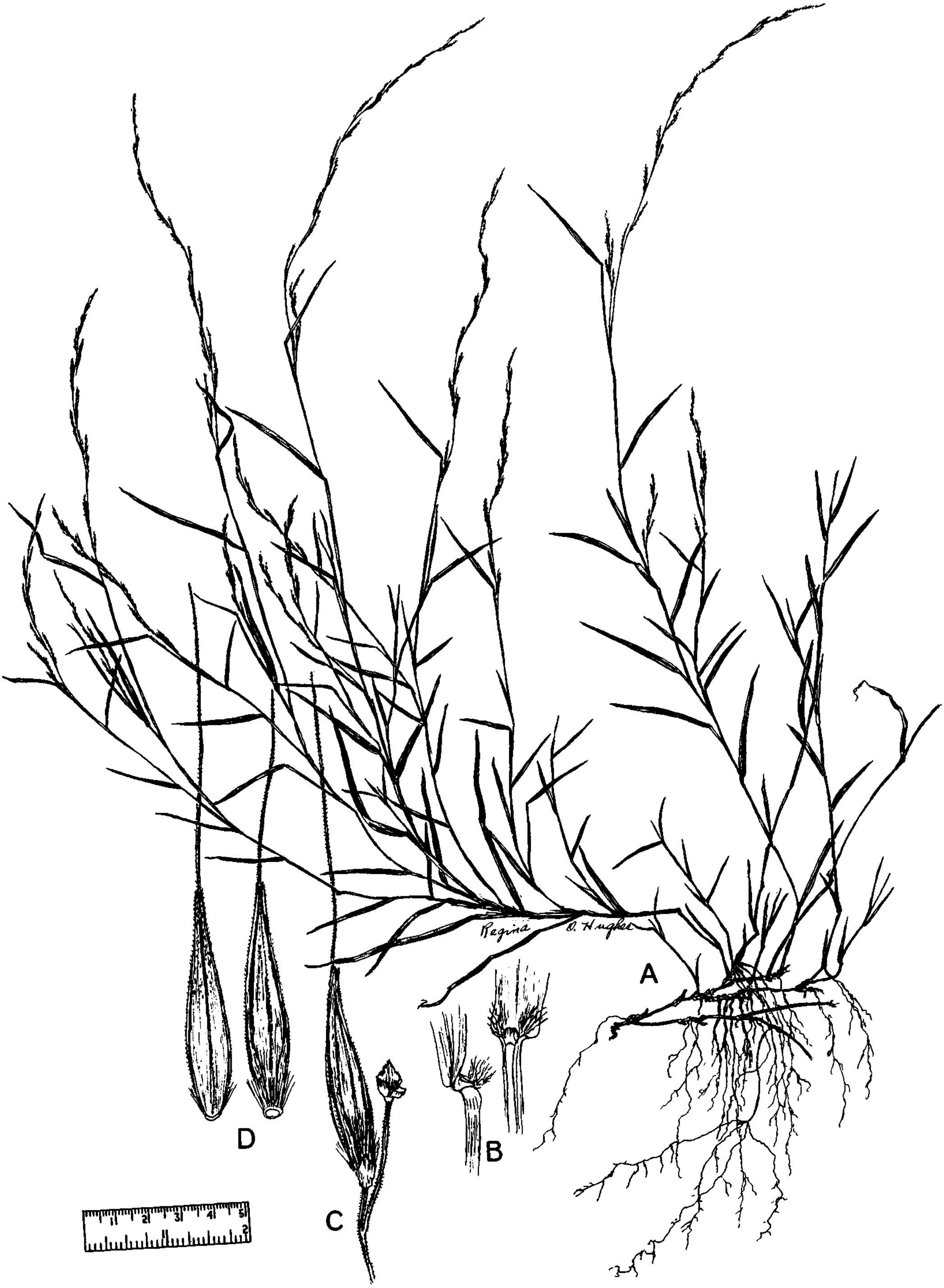
A
B
C
D
Regina O. Hughes

Fig. 105. **Muhlenbergia schreberi:** A, habit; B, ligules; C, spikelet; D, floret (two views). (From Reed, *Selected Weeds of the United States* (1970) Fig. 34)

1. Plant with extensive slender rhizomes, forming extensive colonies; leaves short, mostly less than 5 cm long and conspicuously 2-ranked on the stem to below the inflorescence stalk. 1. *S. virginicus*

1. Plant tufted, not rhizomatous; leaves much longer, mostly near the base, not conspicuously 2-ranked to below the inflorescence.

  2. Panicle loose and open, 5–15 cm broad; spikelets straw-colored, brown, purplish, or reddish brown.

    3. Leaves somewhat leathery, flat, 1–5 mm wide; persistent old basal sheaths relatively coarse, to 5–8 mm wide. 2. *S. floridanus*

    3. Leaves wiry, tightly folded throughout their length or folded below and flat distally, 1 mm wide; persistent old basal sheaths very narrow and fibrous. 3. *S. curtissii*

  2. Panicle relatively compact and condensed, little if any exceeding 2–3 cm broad; spikelets green or lead-colored.

    4. Glumes unequal but neither more than half the length of the spikelet.

      5. First glume truncate, very broadly rounded or very broadly obtuse; panicle loose, not appearing lobed. 4. *S. jacquemontii*

      5. First glume acute (often frayed off at the tip); panicle compact, the branchlets extending outward somewhat making the panicle appear lobed. 5. *S. indicus*

    4. Glumes very unequal, the first half as long as the spikelet or less, the second as long or nearly as long as the spikelet and very similar to the lemma. 6. *S. domingensis*

1. Sporobolus virginicus (L.) Kunth. COASTAL DROPSEED. Fig. 106

Perennial with extensive slender rhizomes and colonial. Stems 1–4 dm tall, rarely more, with overlapping leaf sheaths and blades 5 cm long or less, these conspicuously 2-ranked to below the inflorescence stalk. Inflorescence a congested, narrow panicle 2–10 cm long and mostly about 1 cm broad. Spikelets short-stalked, 2–2.5 mm long, straw-colored at maturity, lanceolate; glumes and lemmas subequal, apices acute to acuminate.

Brackish and saline marshes, salt flats, sandy or muddy shores. Coastal, Va. to s. Fla.; w. to Tex.; W.I. to Braz.; Old World tropics.

2. Sporobolus floridanus Chapm.

Perennial, in large tufts with hard bases; relative to the other species here treated, much coarser. Stems stiff, to 1 m tall or a little more. Leaves stiff, somewhat leathery, flat, 1–4 mm wide. Panicle relatively large, loose, and open, pyramidal in outline, 1.5–4.0 dm long and 1.0–1.5 dm wide, reddish purple to brown, panicle branches ascending, filiform and flexuous. Spikelets 4–5 mm long, reddish purple becoming brown, lanceolate, mostly on filiform stalks varying from 2–20 mm long; glumes unequal, the first about ⅔ as long as the second, the second as long as the spikelet, apices acuminate; lemma and palea about equalling the second glume.

Seasonally wet pine savannas and flatwoods, often in lower places or on somewhat boggy slopes, especially bordering branch bays. Coastal plain, S.C. to n. Fla.

3. Sporobolus curtissii (Vasey) Small ex Scribn.

Tufted perennial. Stems 6–10 dm tall. Leaf blades narrow, wiry, completely folded lengthwise or folded below and flat distally, about 1 mm wide. Panicle loose and open, usually pyramidal in outline, the branches ascending, filiform-flexuous, reddish-purple to brown. Spikelets 4–6 mm long, narrowly lanceolate, on capillary stalks varying from 1–10 mm long, appressed to the branchlets; glumes essentially equal, as long as the spikelet, both longer than the floret, apically long-acute to acuminate.

Pine savannas and flatwoods. Coastal plain, s.e. Ga. and n. Fla.

4. Sporobolus jacquemontii Kunth.

Tufted perennial, weedy. Stems mostly about 1 m tall. Leaves long, narrow, flat below, involute and attenuate apically, 1–2 mm wide. Panicle loose, the branches ascending, lanceolate in overall outline and 1–3 dm long, not appearing lobed as in the following species. Spikelets stalked, somewhat appressed, about 2 mm long, lead-colored; glumes unequal, the first about one-fourth as long as the spikelet, the second about one-half as

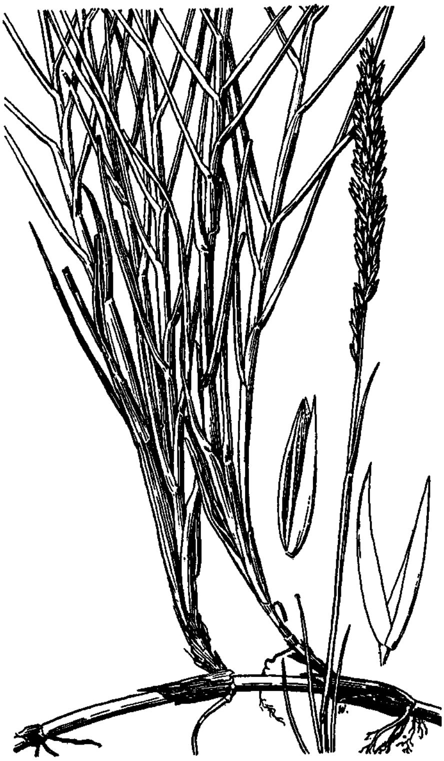

Fig. 106. **Sporobolus virginicus**: portion of plant, panicle, glumes and floret. (From Hitchcock and Chase)

long, both truncate, very broadly rounded or obtuse apically; lemma and palea nearly equal. (*S. indicus* of authors, not (L.) R. Br.)

Moist to wet sands and marls, cultivated fields, roadsides, spoil banks, clearings. Introduced and naturalized, s. Fla., sporadic along the Gulf Coast in n.w. Fla.

5. **Sporobolus indicus** (L.) R. Br. SMUTGRASS. Fig. 107

Tufted perennial, weedy, similar in aspect to the preceding, much more common and widespread. Leaf blades 2–5 mm wide basally, long-attenuate and often involute terminally. Panicle usually narrower and more compact than in the preceding; although compact, the heavily spikelet-bearing branches extending outward somewhat thus giving a lobed aspect to the overall narrowly elongate inflorescence. Spikelets about 2 mm long, lead-colored; glumes half the length of the spikelet or less, apically acute though the tip often frayed; lemma and palea about equal. (*S. berteroanus* (Trin.) Hitchc. & Chase; *S. poiretii* (R. & S.) Hitchc.)

A common plant of lawns, roadsides, open places generally, often where soil is somewhat compacted, open woods, prairies, swales; not usually a wet-ground plant but so ubiquitous as a weed that it may occupy almost any disturbed place. Native to tropical Asia and widely introduced into the Americas; Va., Tenn., s. to Fla. and Tex.

The common name, smutgrass, derives from the fact that the spikelets are very often highly infected with smut.

6. **Sporobolus domingensis** (Trin.) Kunth.

Similar in aspect to *S. jacquemontii* but the panicles much more compact, on the average not as long, not often exceeding 10 cm long, often shorter. First glume about half as long as the spikelet, the second as long or very nearly as long as the lemma and very similar to it.

Marly or sandy-marly soils and sands, spoil banks and fills, roadsides, borders of mangrove swamps, rocky pinelands, waste places. S. Fla.; W.I.

40. Leptochloa (SPRANGLETOPS)

Annuals, usually tufted, the inflorescence with one central rather long axis bearing several to many (4–90) lateral spikelet-bearing shorter branches, i.e., rachi. Spikelets sessile or short-stalked, alternately disposed in two rows on the axis, closely spaced to overlapping, usually appressed to the axis. Spikelets 3–12-flowered, the lower florets bisexual, the upper staminate or rudimentary. Glumes unequal to subequal, 1-nerved (or the second sometimes 3-nerved, acute or mucronate, awnless but sometimes aristate). Lemmas apically sometimes 2-toothed, mucronate, or short-awned. Disarticulation is above the glumes and between the lemmas, thus after the fruits are shed the glumes remain intact. Ligule a lacerate scale.

1. Sheaths with long pustular-based hairs. 1. *L. filiformis*
1. Sheaths glabrous.
  2. Spikelets very closely overlapping each other, 2–3 mm long, 3–4-flowered; glumes and lemmas straw-colored. 2. *L. nealleyi*
  2. Spikelets loosely overlapping each other, 5–10 mm long, 6–12-flowered; glumes and lemmas grayish green or lead-colored.
    3. Lemmas short-awned apically. 3. *L. fascicularis*
    3. Lemmas obtuse to rounded apically and with the midrib slightly extended beyond the tip as a mucro, or apically acuminate.
      4. The lemmas obtuse to rounded apically, mucronate at the tip. 4. *L. uninervia*
      4. The lemmas acuminate apically. 5. *L. panicoides*

1. **Leptochloa filiformis** (Lam.) Beauv. RED SPRANGLETOP. Fig. 108

Usually several-branched from near the base, the spikelets more or less suffused with reddish purple pigment, the herbage as well sometimes. Lower stems often zigzagging, in vigorous specimens the lower stems may be decumbent and rooting at the nodes;

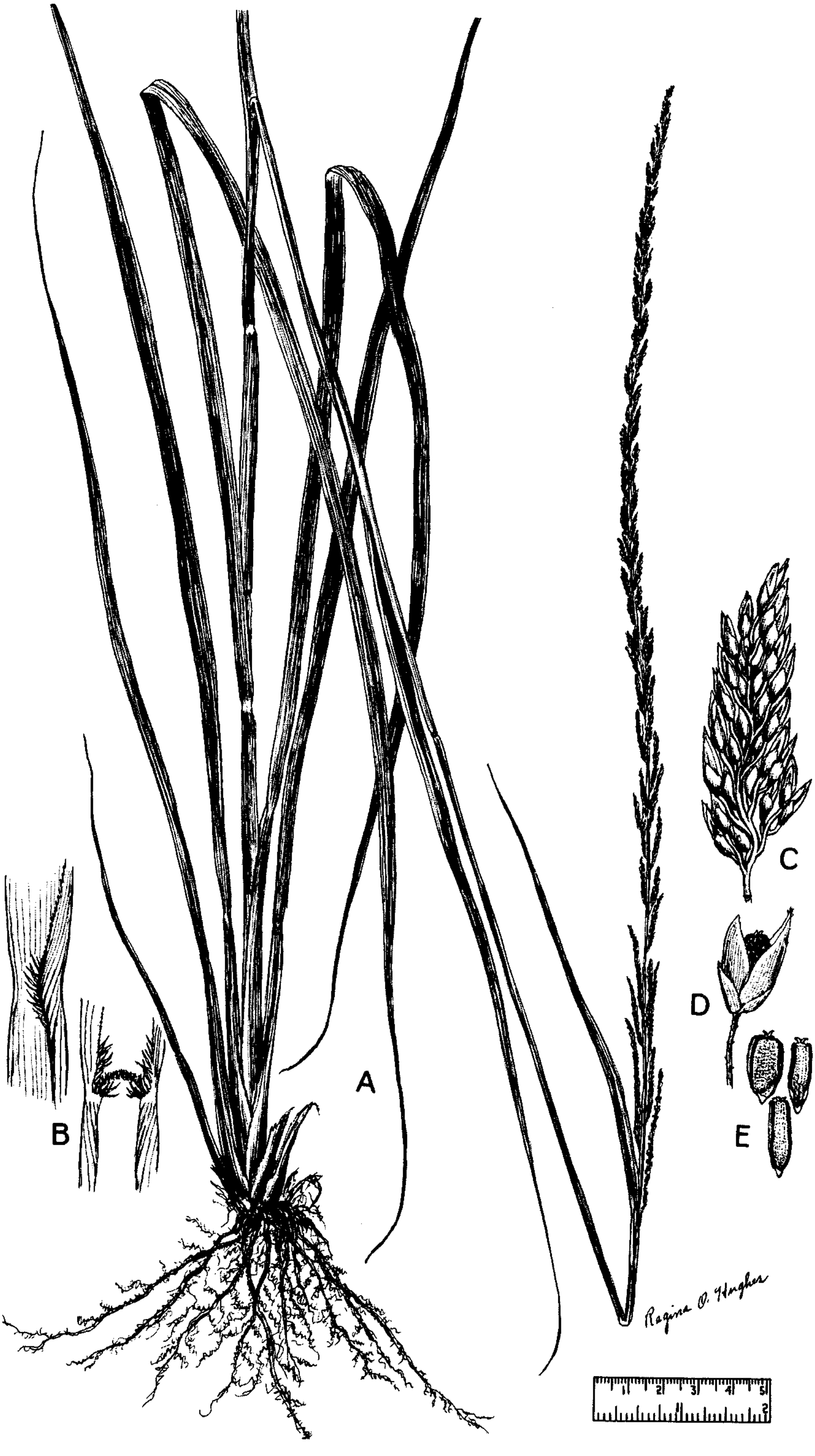
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Fig. 107. **Sporobolus indicus:** A, habit; B, ligules; C, portion of panicle; D, spikelet; E, grains. (From Reed, *Selected Weeds of the United States* (1970) Fig. 42 (as *S. poiretii*))

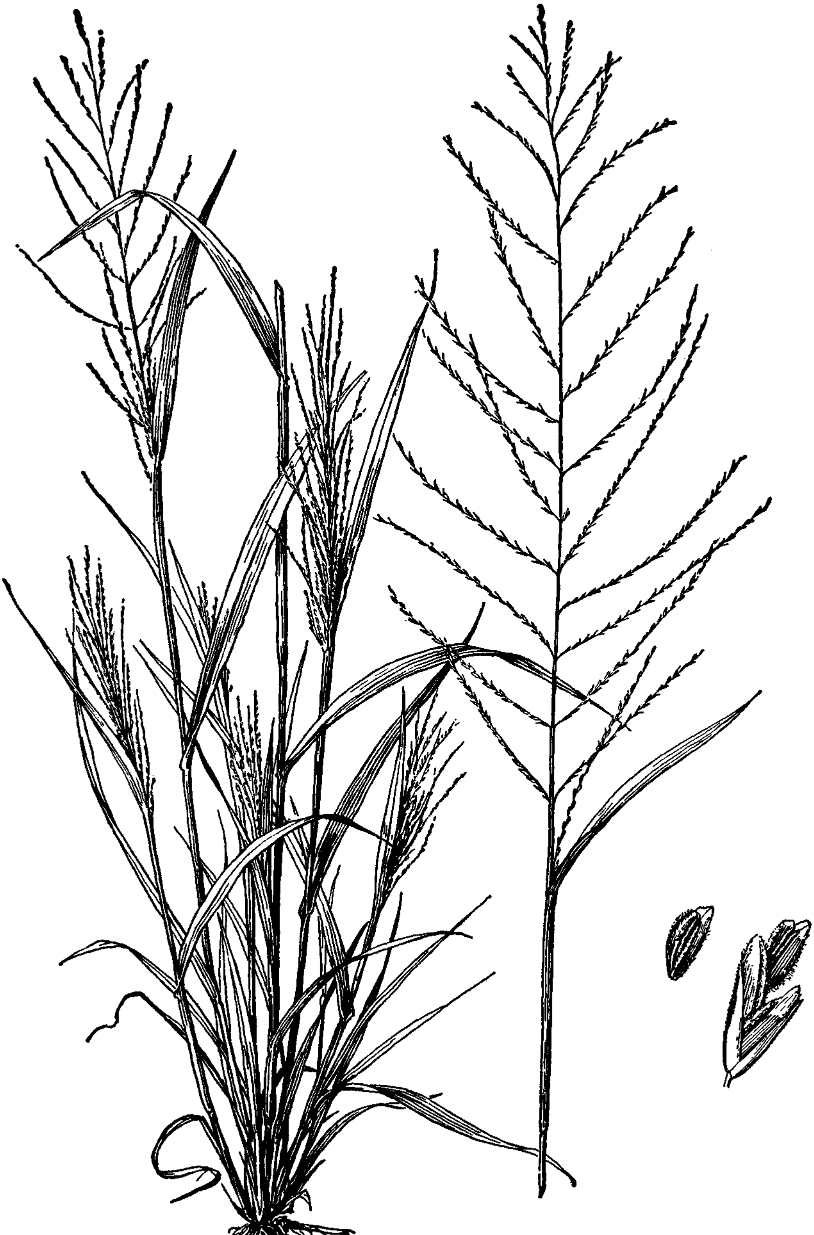

Fig. 108. **Leptochloa filiformis:** habit, panicle, spikelet and floret. (From Hitchcock and Chase)

variable in height, from 2–10 (–12) dm tall, leafy below the inflorescence. Sheaths with long pustular-based hairs, if the hairs deciduous the pustular bases remain; blades flat, soft, 2–20 cm long and 1.5–10 mm wide, long-tapering. Main axis of the inflorescence from 1–3.5 dm long or longer, the laterals usually numerous (7 to about 70), variable in length, from 1–15 cm, flexuous. Spikelets scarcely overlapping if at all, small, 2–4-flowered, 2–2.5 mm long; glumes acute (see note below), lemmas acute to blunt, usually with a short mucro.

In moist to wet soils, on alluvium along streams or ponds, in cultivated and disturbed places; generally weedy. Va. to Fla. and Tex.; northward in the interior to s. Ind., Ill., and Mo.; trop. Am.

Note: In a part of the range, chiefly in the interior of the U.S., some specimens essentially as described above differ mainly in having aristate glumes. These are treated by some authors as *L. attenuata* (Nutt.) Steud. or as *L. filiformis* var. *attenuata* (Nutt.) Steyermark and Kucera.

2. Leptochloa nealleyi Vasey.

Relatively robust, unbranched, the stems to 1.5 m tall. Sheaths markedly keeled, broad, glabrous, blades variable in length, in some specimens much shorter on lower leaves than on upper ones, in other specimens long on both, 3–30 cm long, flat or involute, 2–7 mm wide. Main axis of the inflorescence very long relative to the laterals, to 4 dm long or longer, the laterals 2–4 cm long, evenly disposed. Spikelets very closely overlapping and angling from the rachis, 3–4-flowered, 2–3 mm long; first glume apically acute to obtuse, the second rounded; lemmas obtuse.

In marshes, banks of bayous and sloughs. La. to Tamaulipas, Mex.

3. Leptochloa fascicularis (Lam.) Gray. BEARDED SPRANGLETOP, SALT-MEADOW GRASS. Fig. 109

Stems several to numerous from the base, unbranched above, 3–10 dm tall. Sheaths smooth; blades to 2.5 dm long, 1–3 mm wide, mostly involute. Main axis of the inflorescence 1–3 dm long, 4–10 cm broad, often not wholly exserted from the sheaths, the laterals stiffly ascending, unevenly disposed. Spikelets moderately overlapping and strongly ascending, grayish green or lead-colored, 6–12-flowered, 5–10 mm long, the hairs on the lemmas often conspicuous as seen from the side of the spikelet (with magnification); first glume much shorter than the second; lemmas short-awned. (*Diplachne fascicularis* (Lam.) Beauv.)

In fresh water, brackish and saline, wet to well-drained soils, pond or lake beds, marshes, alluvial sands, peaty-mucky shores, sometimes in shallow water, cultivated and disturbed places. Widespread through much of the U.S. southward to Argentina; sporadic in parts of the range.

4. Leptochloa uninervia (Presl.) Hitchc. & Chase.

In general very similar to *L. fascicularis* (and doubtfully specifically distinct from it), in similar habitats and with similar range. Differing mainly in that the spikelets are generally somewhat smaller (not always) and more especially the lemmas not awned but mucronate apically.

5. Leptochloa panicoides (Presl.) Hitchc.

Annual. Stems single or frequently with several from the base, 3–8 (–10) dm tall. Sheaths smooth, blades 5–10 mm wide, margins scabrid. Inflorescence 1–3 dm long, to 10 cm broad, lateral spikelet bearing branches usually not crowded, ascending, divaricate, or the lower reflexed. Spikelets moderately overlapping, ascending, grayish green, 4–5 mm long, 5–7-flowered; first glume somewhat shorter than the second; lemmas keeled, with 3 bright green ribs, pale between the ribs, apically acuminate.

Floodplain forests, swamps, exposed bars and shores of rivers and streams. Native of Brazil, naturalized s. Ind., Mo., Ark., e. and s.e. Tex., La., Miss.

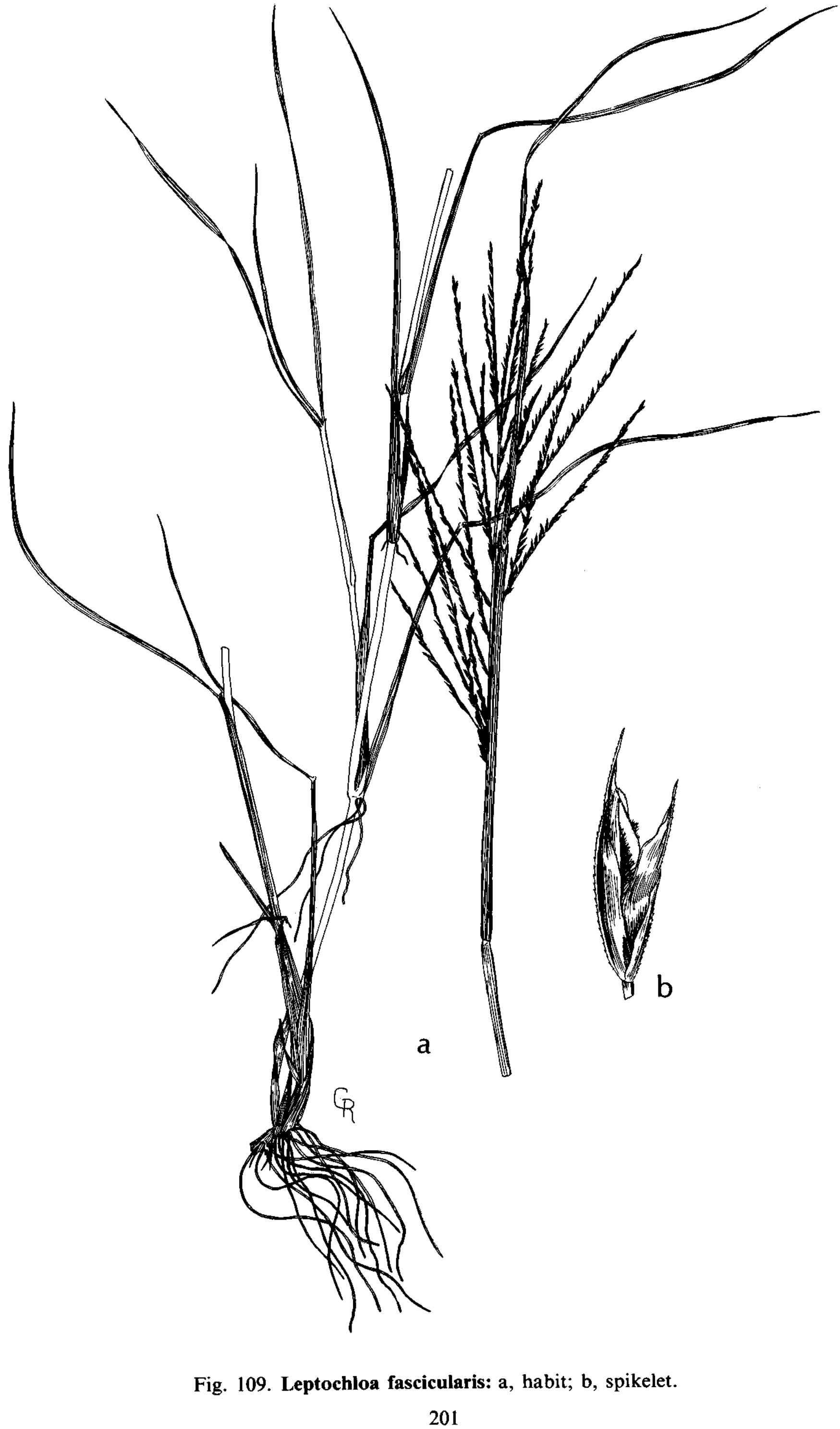

Fig. 109. **Leptochloa fascicularis:** a, habit; b, spikelet.

41. Chloris (FINGERGRASSES)

Chloris glauca (Chapm.) Wood. Fig. 110

Glabrous and glaucous, rather robust perennial, solitary, or often forming large tufts or colonies by basal offshoots. Stems strongly flattened, mostly about 7–12 dm tall. Leaves numerous at the base, in two ranks, their compressed sheaths overlapping below thence spreading, the basal part of the plant thus fanlike. Leaf sheaths conspicuously keeled and compressed; blades with one prominent nerve, folded, usually becoming flat toward the blunt tip, the margins of the blade very finely scabrous-toothed. Ligule a very low collarlike scale bearing very short hairs abundantly all along its upper edge. Inflorescence terminal, comprised of 8–16 or more ascending-erect, subracemose spikes of somewhat unequal length, all arising at about the same point at the summit of the stem. Spikelets 1.5–2 mm long, subsessile, borne alternately in two rows along one side of a 3-angled, rough-pubescent axis; closely overlapping and extending outward almost at right angles to the axis. Disarticulation is above the glumes so that after the spikelets are shed the spikes appear feathery. Spikelet 1-flowered; glumes 2, unequal, the lower acute, the upper longer and with a short upwardly barbed awn; both with a prominent green midnerve, the curling sides membranous, irregularly rough-pubescent on the upper portions of the outside; lemma dark brown, glabrous, or only slightly rough-pubescent on the nerves; broadly two-angled on the back, the edges rolled inward, boatlike. The palea whitish membranous and flattish, fitting deeply within the "hull" of the lemma. To the side of the palea, the spikelet axis is barely prolonged and bearing terminally a brown, tight clublike cluster of rudimentary bracts (sterile lemmas); this clublike cluster fits closely against the palea, somewhat into the "hull" of the boatlike fertile lemma.

Moist to wet sandy or sandy-peaty areas, borders of lowland woodlands, clearings, borders of fresh to brackish marshes, often in calcareous areas and more frequent near the coasts. Coastal plain, s.e. N.C. to s. Fla., s. Ala.

Chloris petraea Sw. is the most common species of fingergrass in our range. Although it occurs in dry to moist sandy or sandy-peaty places, it is not really a wet-ground plant. It is generally much less robust, the inflorescence with 6 or fewer spikes, and its lemmas are markedly ciliate on the nerves. Other native species occur on well drained sites; several introduced species are sporadic and weedy.

42. Spartina

Perennials, mostly stout, coarse, tough and fibrous, usually with scaly rhizomes, extensively creeping or forming dense tufts or clumps. Aerial stems simple, rigidly erect, bearing long, tough, flat to markedly involute blades. Ligule a fringe of relatively few to numerous short bristles or stiff hairs. Spikelets 1-flowered, very strongly flattened, sessile, overlapping, disposed in two rows along one side of a triangular axis thus forming 1-sided spikes. Spikes in turn borne along a single common axis, few to many in number, disposed in an open more or less racemose manner or rarely in a compact cylindric inflorescence. Glumes, lemma, and palea all keeled, strongly folded or flattened; glumes very unequal, the first shorter than the lemma to about equalling it, the second longer than the lemma thus giving the length of the spikelet, lemma thinner than the second glume; palea equalling to exceeding the lemma. Disarticulation is below the glumes.

1. Principal leaf blades 5–20 mm wide, flat, if rolled in drying then not strongly involute except distally.
  2. Keels of the glumes smooth. 1. *S. alterniflora*
  2. Keels of the glumes bearing short, stiff, spinelike forward-pointing trichomes.
    3. Second glume with an awn 5–10 mm long. 2. *S. pectinata*
    3. Second glume sharp pointed but not awned. 3. *S. cynosuroides*
1. Principal leaf blades strongly inrolled, 5 mm across or less.

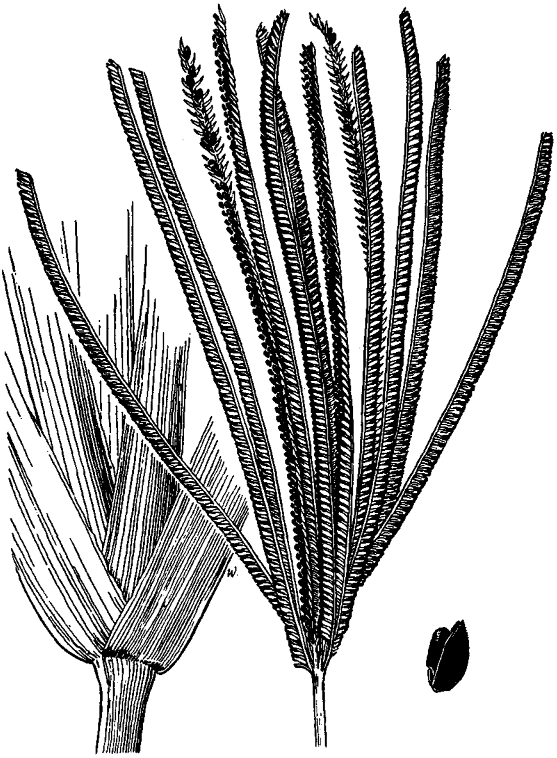

Fig. 110. **Chloris glauca:** view at a lower node, inflorescence, floret. (From Hitchcock and Chase)

4. Spikes very short and compacted thus forming an approximately cylindrical inflorescence. 4. *S. spartinae*
4. Spikes not compacted into a cylindrical inflorescence.
  5. Second glume moderately tapered, the very tip blunt, its keel scabrid distally; plants usually bloom in summer or autumn on stems of the season. 5. *S. patens*
  5. Second glume sharply tapered to a long fine point, its keel scabrid its entire length; plants usually flower early in the season on stems of a previous season. 6. *S. bakeri*

1. **Spartina alterniflora** Loisel. SALTWATER CORDGRASS, SMOOTH CORDGRASS. Fig. 111

Plant with tough rhizomes deep-seated in the substrate, forming colonies. Aerial stems very variable in stature, 2–15 dm tall, slender or coarse, stiffly erect, smooth. Leaf blades 4–15 mm wide or wider toward the flat base, distally usually involute, the margins smooth to somewhat scabrid. Spikes (1–) 5–15, sometimes more, from the central axis, 4–10 cm long, appressed-ascending and overlapping. Spikelets mostly 10–40 per spike; first glume shorter than the lemma, second glume exceeding the lemma, 10–14 mm long, hard, its keel smooth.

Colonial in tidal waters of muddy outer shores, salt marshes. Nfld. to s. Fla., w. to Tex.

2. **Spartina pectinata** Link. PRAIRIE CORDGRASS. Fig. 112

Plant with long scaly rhizomes to about 8 mm thick. Aerial stems moderately coarse, 7–20 dm tall, smooth. Leaf blades 5–10 mm broad, striate, flat below, involute distally, more involute on drying, the margins scabrid. Spikes 5–20 or more from the central axis, usually short-stalked, diverging to strongly ascending, to 15 cm long. Spikelets 40–80 per spike, sometimes fewer; first glume about as long as the lemma, toothed on the keel and on both edges, narrowed to an aristate tip; second glume strongly spiny-toothed on its keel, narrowed to a scabrid awn-tip from a third to about as long as the body.

Fresh water marshes, meadows, prairies, river gravels. Nfld. to e. Wash. and Oreg., generally s. to w. N.C., Ark., Tex., N.Mex.

3. **Spartina cynosuroides** (L.) Roth. BIG CORDGRASS. Fig. 113

Plant with coarse scaly rhizomes about 1.5 cm thick, deep-seated in the substrate. Aerial stems very coarse, 3–4 m tall, smooth. Leaf blades very coarse, to 7 dm long or longer and 1–2.5 cm wide, long-tapering to an involute tip, the margins more or less scabrid. Spikes numerous from the central axis, usually exceeding 20, commonly to 50 or more, 5–15 cm long, usually sessile, ascending and overlapping. Spikelets averaging about 12 mm long; glumes hard, first glume 4–7 mm long, keeled below, smooth to spiny-toothed on base of keel and on the margins; second glume a little longer than the lemma, its apex variable, blunt to narrowed to a sharp point, usually spiny-toothed on the keel.

Colonial, abundant locally, in muck of brackish to fresh coastal marshes. Mass. to Fla., w. to s.e. Tex.

4. **Spartina spartinae** (Trin.) Hitchc. GULF CORDGRASS. Fig. 114

Plants in dense tufts, not rhizomatous. Stems mostly to 1 m tall, sometimes to 2 m. Leaf blades narrow and strongly involute, narrowed to hard sharp tips. Spikes 10–many from the central axis but very closely appressed and overlapping, forming a compact cylindrical to fusiform inflorescence 5–15 (–30) cm long. Spikelets 6–8 mm long; first glume shorter than the lemma, abruptly narrowed to a short-acuminate tip, the keel and margins smooth to spiny-toothed; second glume longer than the lemma, spiny-toothed on the keel, the apex narrowed to a sharp point. (*S. argentinensis* Parodi)

Saline flats, marshes and wet prairies, mostly (but not always) near the coast. S. Fla. to Tex.; Mex. and C.Am., Parag., Argentina.

5. **Spartina patens** (Ait.) Muhl. SALTMEADOW CORDGRASS. Fig. 115

Plants sometimes without rhizomes and forming tufts; sometimes with slender rhizomes

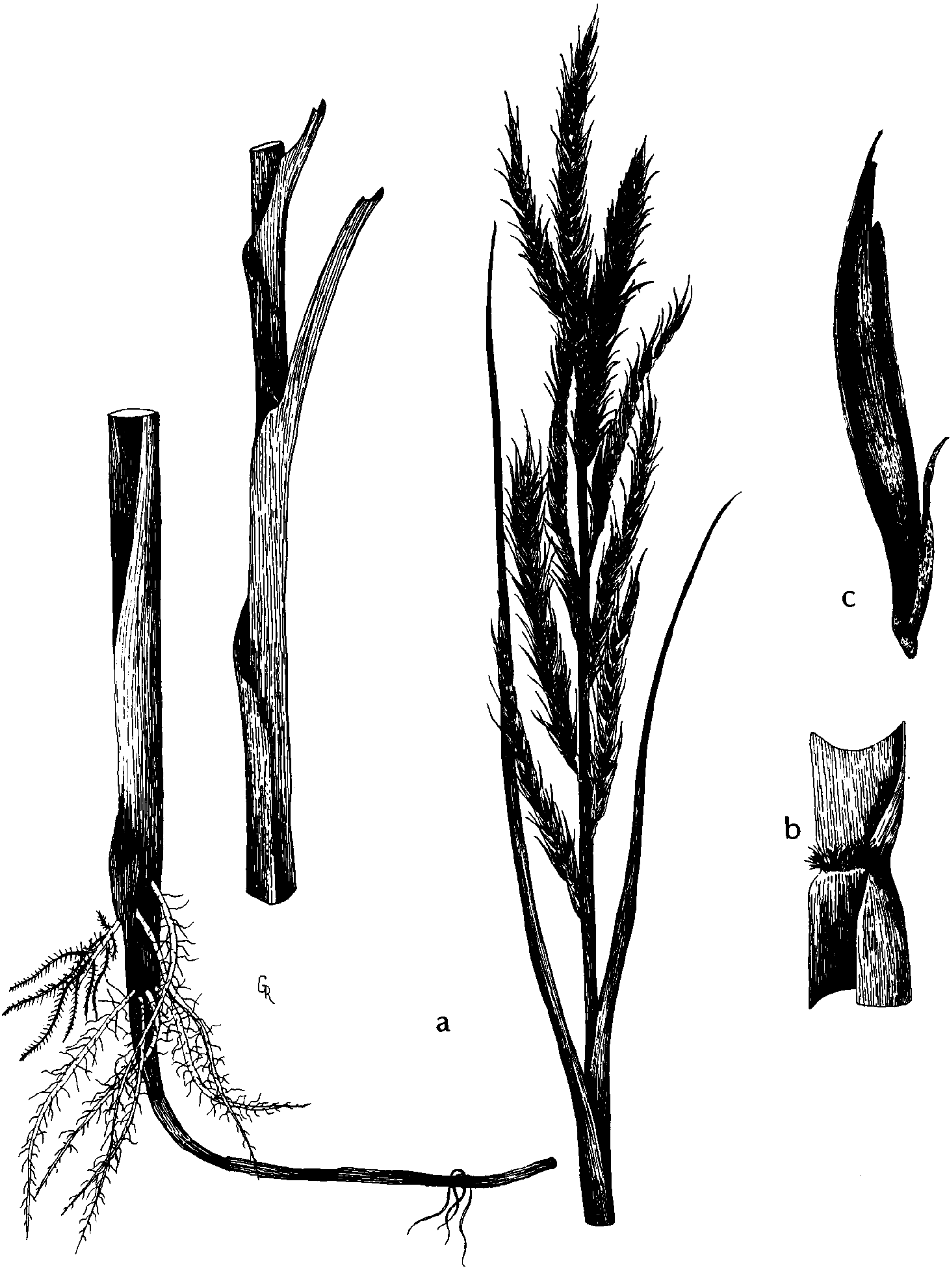

Fig. 111. **Spartina alterniflora:** a, parts of plant; b, ligule; c, spikelet.

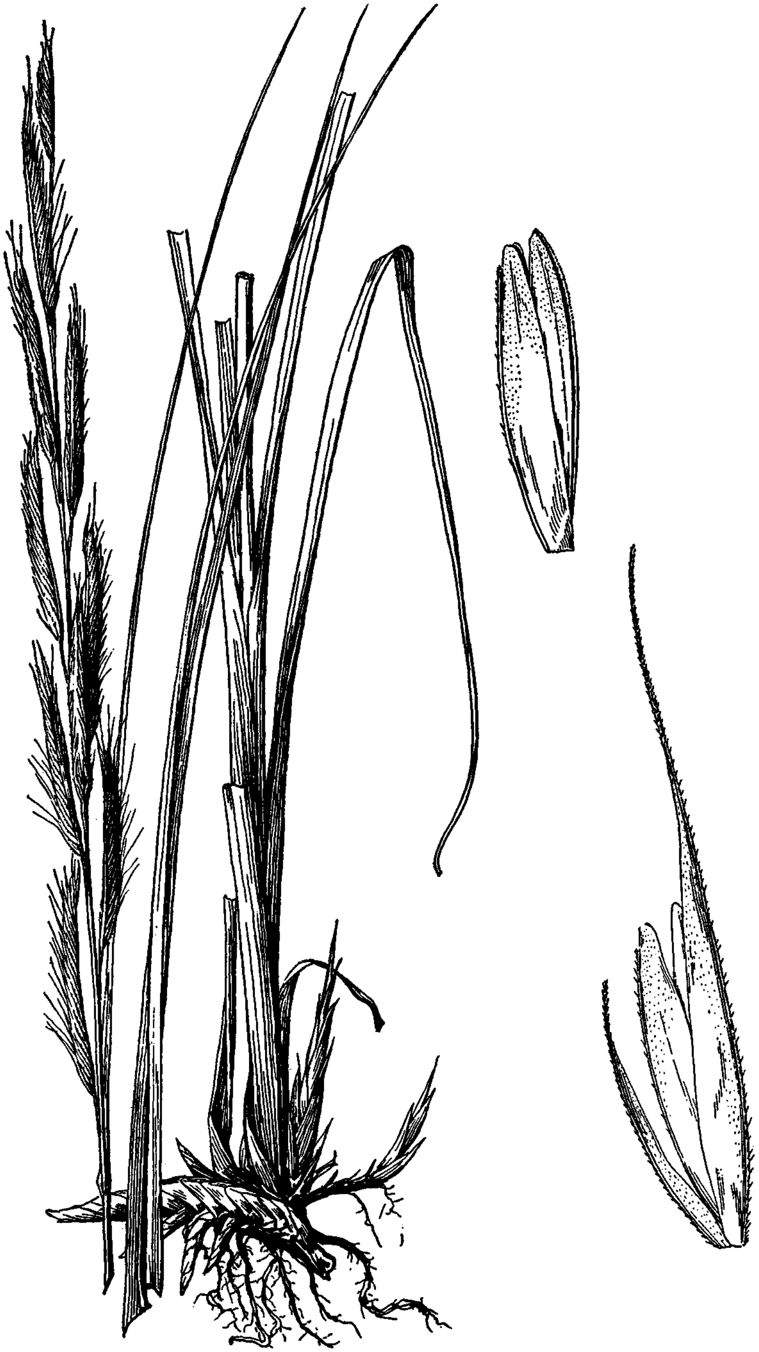

Fig. 112. **Spartina pectinata:** parts of plant, spikelet and floret. (From Hitchcock and Chase)

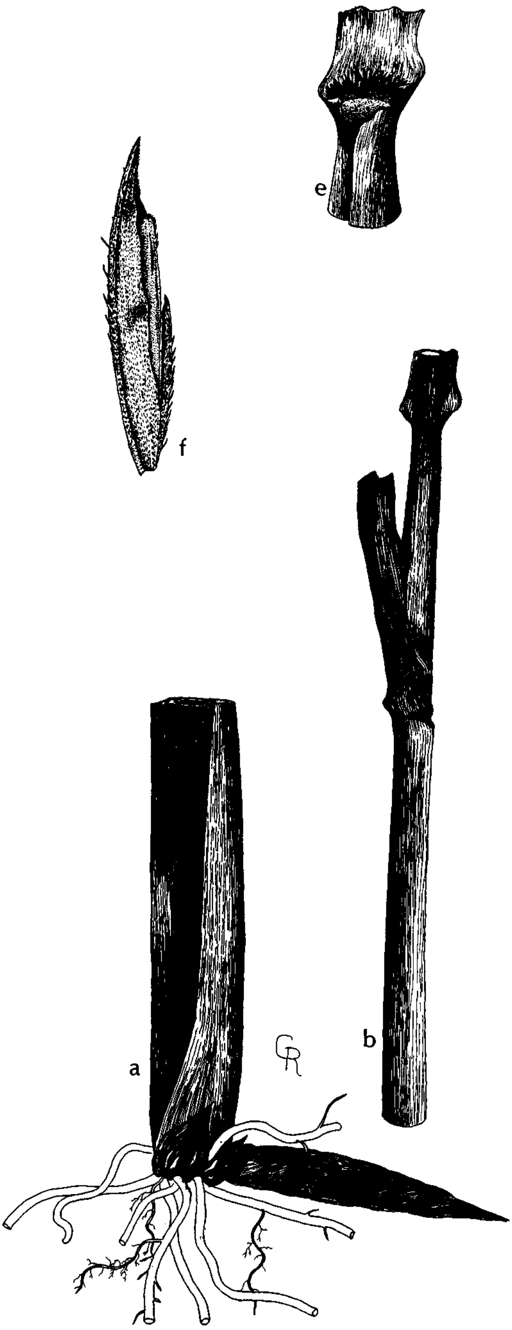

Fig. 113. **Spartina cynosuriodes:** a, basal part of plant; b, lower center section of stem; c, upper center section of stem; d, panicle; e, ligule, f, spikelet.

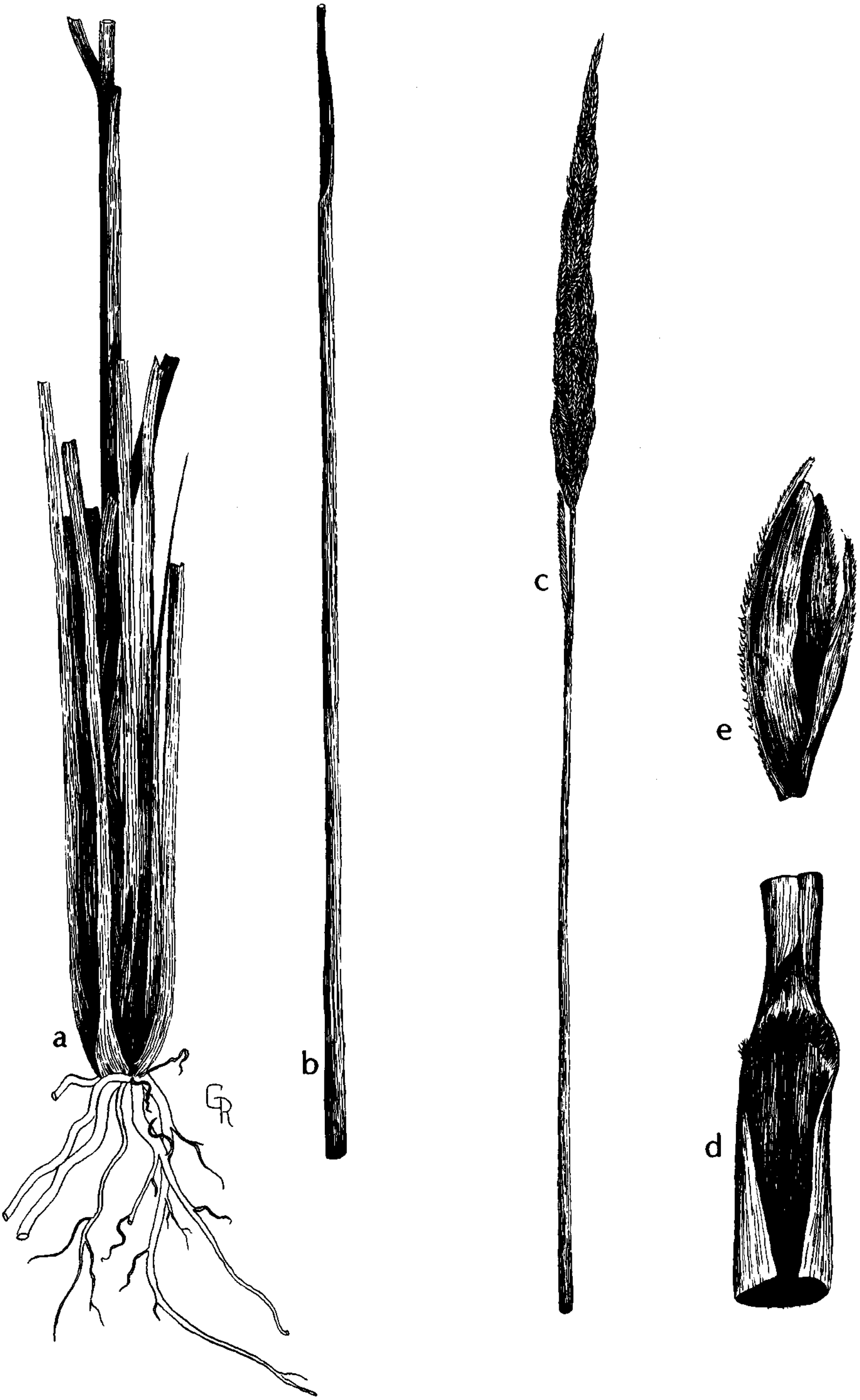

Fig. 114. **Spartina spartinae:** a, basal part of plant; b, middle section of stem; c, panicle; d, ligule; e, spikelet.

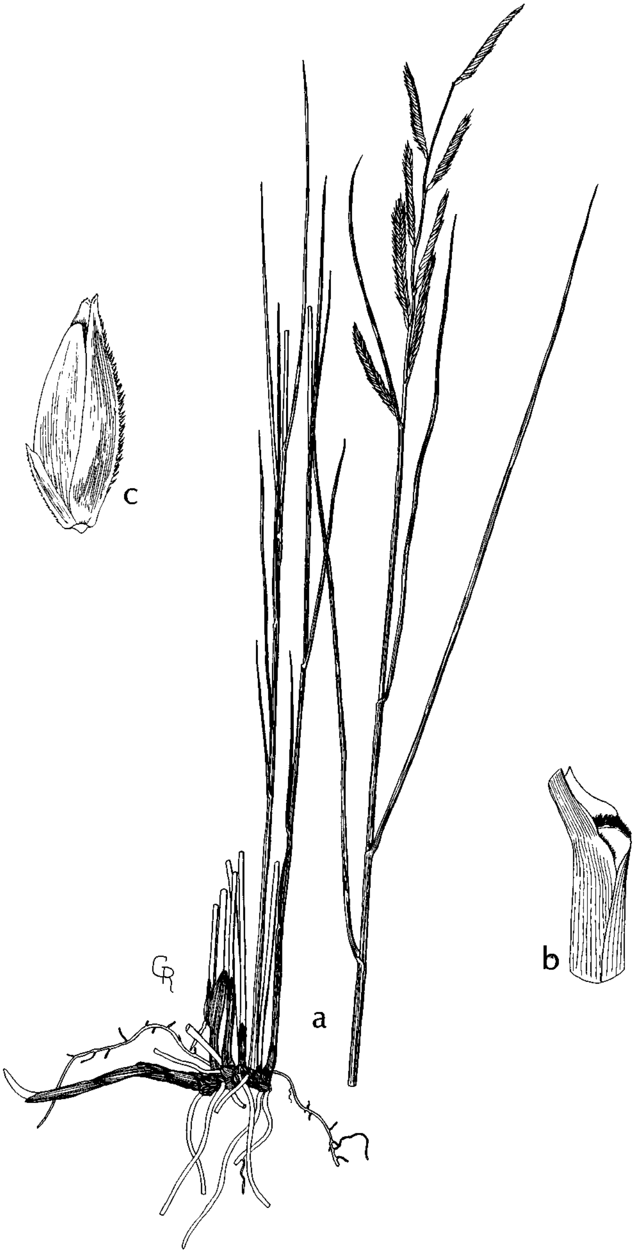

Fig. 115. **Spartina patens:** a, habit; b, ligule; c, spikelet.

2–4 mm thick, the runners often extending some distance in about straight lines with intermittent tufts of aerial stems, eventually mat-forming. Aerial stems smooth, slender, variable in height but mostly less than 1 m tall. Leaf blades very slender, 1.5–3 mm broad, usually flat basally when fresh and not under water stress, involute distally and the tips tapered to sharp points, involute on drying or when under water stress. Spikes 2–6 from the central axis, 1–7 cm long, short-stalked or sessile, ascending, little overlapping. Spikelets 7–12 mm long; first glume about as long as the lemma, the keel with a few sharp teeth distally, the apex lobed on each side beyond the midrib; second glume much longer than the lemma, few-toothed on the keel distally, the tip somewhat tapered but blunt at the extreme tip.

Sandy saline to brackish flats, low dunes, wet sandy tidal shores, tidal pools. Que. to s. Fla., w. to Tex.; in saline marshes Great Lakes area; W.I., s. Eur., n. Afr.

6. Spartina bakeri Merr. Fig. 116

Plant perennating from basal offshoots or with short rhizomes, forming extremely large, leafy clumps; in water sometimes with elongate free runners and mat-forming. Aerial stems 1–2 m tall, smooth, usually with a few flowering stems per clump; these mostly present in spring on stems of a previous season. Leaf blades elongate, narrow, strongly involute and needlelike. Spikes 3–12 or more, 1–6 cm long, ascending and loosely overlapping to closely appressed-ascending. Spikelets 6–8 mm long; first glume not quite as long as the lemma, strongly tapered apically, the keel few-toothed distally; second glume longer than the lemma, apically long-tapered, the keel toothed throughout its length.

Borders of marshes, wet prairies, wet pinelands. S.e. Ga. and Fla.

43. Ctenium

Ctenium aromaticum (Walt.) Wood. TOOTHACHE GRASS, ORANGE-GRASS. Fig. 117

Tufted perennial, the bases usually with an abundance of old persisting fibrous leaf bases. Fresh herbage and inflorescences, when bruised or crushed, very aromatic, the odor somewhat like that of citrus. Stems to 1.2 m tall or somewhat taller, nodes glabrous, internodes minutely pubescent. Leaves mostly near the base, sheaths minutely pubescent, blades slender, to 4 dm long, 1–5 mm wide, long-tapering, flat or involute distally, or involute throughout their length upon drying or when under water stress; finely striate, margins rolled upward, finely scabrid and sometimes with scattered longer hairs. Ligule a membranous scale 1–1.5 mm long, often lacerate. Inflorescence very distinctive, the spikelets sessile, all on one side of a single curvate axis 6–15 cm long, closely set in 2 rows and strictly at right angles to the axis thus giving a pectinate appearance. Spikelets 5–7 mm long, excluding awns; with 2 unequal glumes, the first small, hyaline, acute, the second nearly as long as the spikelet, centrally 2-nerved on the keel, the sides thin-hyaline, nerves papillose-glandular, apically unequally bifid, a divergent awn arising from the keel somewhat above the midpoint; first lemma empty, somewhat shorter than the second glume, hyaline except for the very finely scabrid midnerve, apex bifid and awned from between the lobes, with a brush of cilia basally and at about the midpoint on each margin; second lemma empty, similar, also awned but the awn arising just back of the tip, the tip pointed, not bifid; a similar, bifid, awned third lemma and palea subtend the single floret, the palea, however, with a very short awn and without the basal and lateral brushes of cilia; above the floret 1–3 much reduced empty papery lemmas. Disarticulation is above the glumes. (*Campulosus aromaticus* (Walt.) Trin.)

Seasonally wet pine savannas, flatwoods, bogs. Coastal plain, s.e. Va. to cen. Fla., w. to La.

In Florida, apparently in similar habitats, is a closely similar species, *C. floridanum* (Hitchc.) Hitchc. (*Campulosus floridanus* A. Hitchc.), which differs chiefly in being rhizomatous and in lacking the papillose glands on the second glume of the spikelet. We question whether this is specifically distinct.

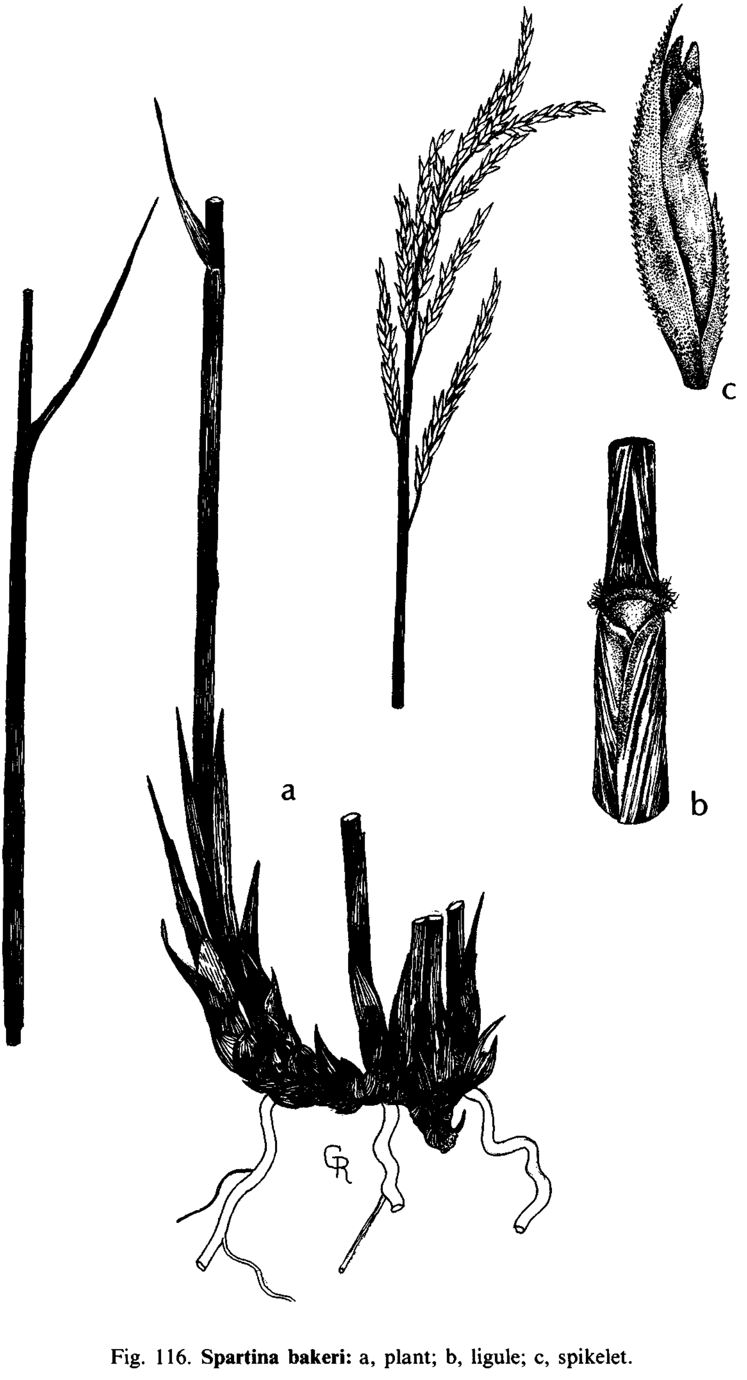

Fig. 116. **Spartina bakeri:** a, plant; b, ligule; c, spikelet.

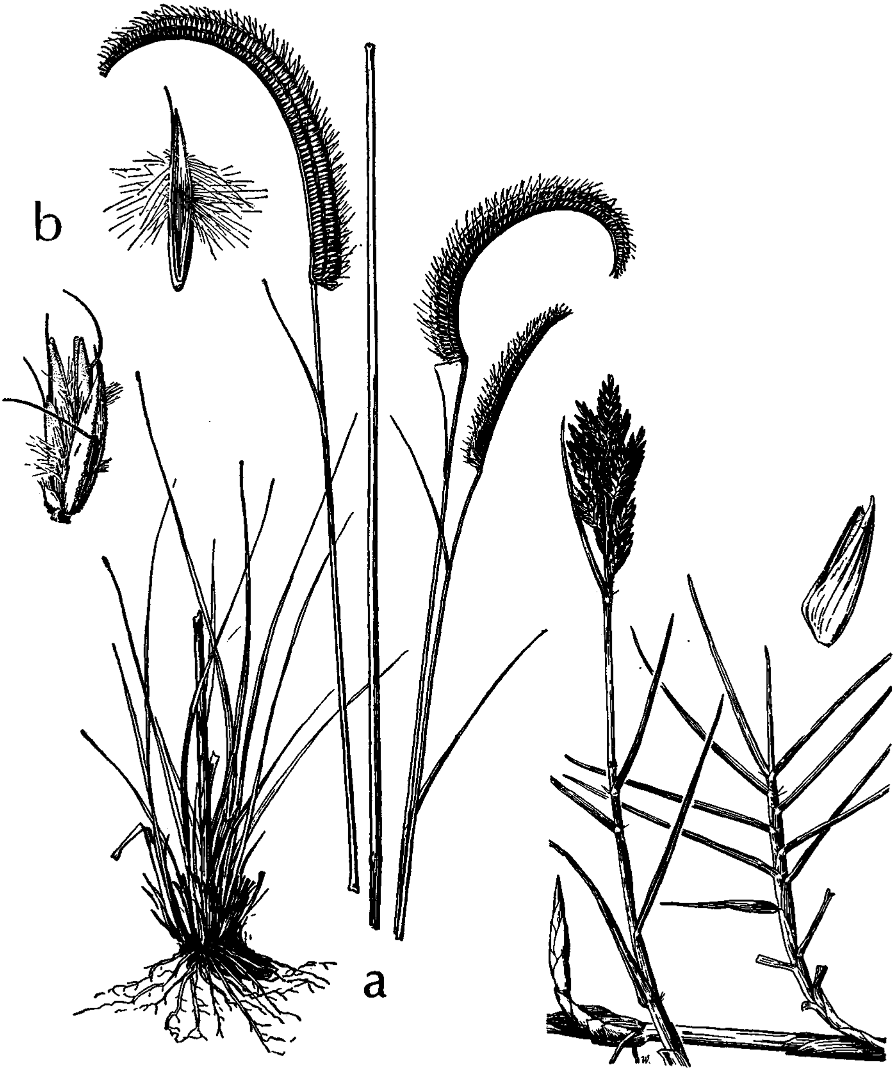

Fig. 117. a–b, **Ctenium aromaticum:** a, portions of plant; b, spikelet and floret; c, **Distichlis spicata:** habit and floret. (From Hitchcock and Chase)

44. Distichlis

Distichlis spicata (L.) Greene. SPIKE GRASS, ALKALI GRASS. Fig. 117

Low, glabrous perennial, with extensive scaly rhizomes from which simple erect flowering stems arise, the latter variable in height, up to 6–7 dm tall, commonly less tall where the plant is thickly matted. Lower leaves consisting of sheaths only, upwards very gradually becoming blade-bearing. Sheaths conspicuously overlapping each other, at least on the lower part of the stem, the blades conspicuously spreading-ascending; disposed in two vertical ranks, flat, folded, or rolled upward, often until their edges meet; stiff, thus often appearing filiform-terete-attenuate, mostly under 10 cm long. Upper surfaces with numerous paralleling rounded ridges having papillose surfaces and very narrow channels between; ligule a very low, stiff-membranous collar with a very finely ciliate edge. Inflorescence a dense spikelike panicle, 5–7 cm long or less. Spikelets pedicillate, mostly 5–9-flowered, unisexual, plants dioecious, the clones, therefore, of one sex or the other; disarticulation is above the glumes and between the florets; glumes two, unequal, keeled, hard on the back, the margins membranous, variously 3–7-nerved, the lateral nerves sometimes obscure; first glume 2–3 mm long, the second 3–4 mm long; lemma 3–6 mm long, folded but rather rounded on the back, barely pointed at the tip, with 9–11 often faint nerves, the margins membranous; palea 3–5 mm long, sharply keeled, the keel very finely hispid-ciliate, much broader at the base than above, rather abruptly long-tapering to the tip, thus somewhat falcate, the margins thin-membranous and inrolled.

In our range, in brackish marshes and salt flats near the coast. Gulf of St.L., s. to Fla., w. to Tex., locally inland to Mo.; B.C. to Mex.; Bah.Is., Cuba, S.Am.

45. Monanthochloe

Monanthochloe littoralis Engelm. KEY GRASS. Fig. 118

Perennial, rhizomatous and stoloniferous, mat-forming. Stems stiff, wiry, erect from the hard rhizomatous bases to 1–2 dm., or shorter erect stems from stoloniferous runners; leaves closely overlapping on short-shoots, sheaths hard and thick, blades short, hard, thick, striate and subulate, falcate, 5–10 mm long. Spikelets staminate or pistillate on separate plants, more or less "embedded" in the leaf clusters.

Salt marshes, tidal flats. Cen. e. coast of Fla. and s. Fla.; La., Tex., s. Calif., Mex., Cuba.

46. Aristida (THREE-AWN GRASSES)

Annual or perennial, relatively slender, with narrow leaf blades and usually tufted. Inflorescence usually a narrow and spikelike panicle, in some species lax and open. Spikelets 1-flowered; glumes unequal to equal, 1-nerved or sometimes with a lateral nerve on one side; lemma hard, tightly convoluted about the palea and grain, thus terete, long and narrow, with a hard obconical usually hairy callus basally, terminally narrowed and bearing a usually trifid awn. Disarticulation is above the glumes but one of the glumes falling early in some.

Several species other than those treated below occur in our range; they are generally plants of well-drained sites though occasionally may occur in adjacent moist, usually disturbed, places.

1. Mature leaves densely villous on the upper surface at or near the base of the blade, sometimes also on the summit of the sheath. 1. *A. stricta*
1. Mature leaves, if pubescent at all, not as above.
    2. Inflorescence a widely branched loose and open lax panicle, the branchlets drooping. 2. *A. patula*
    2. Inflorescence narrow and spikelike or densely brushlike.

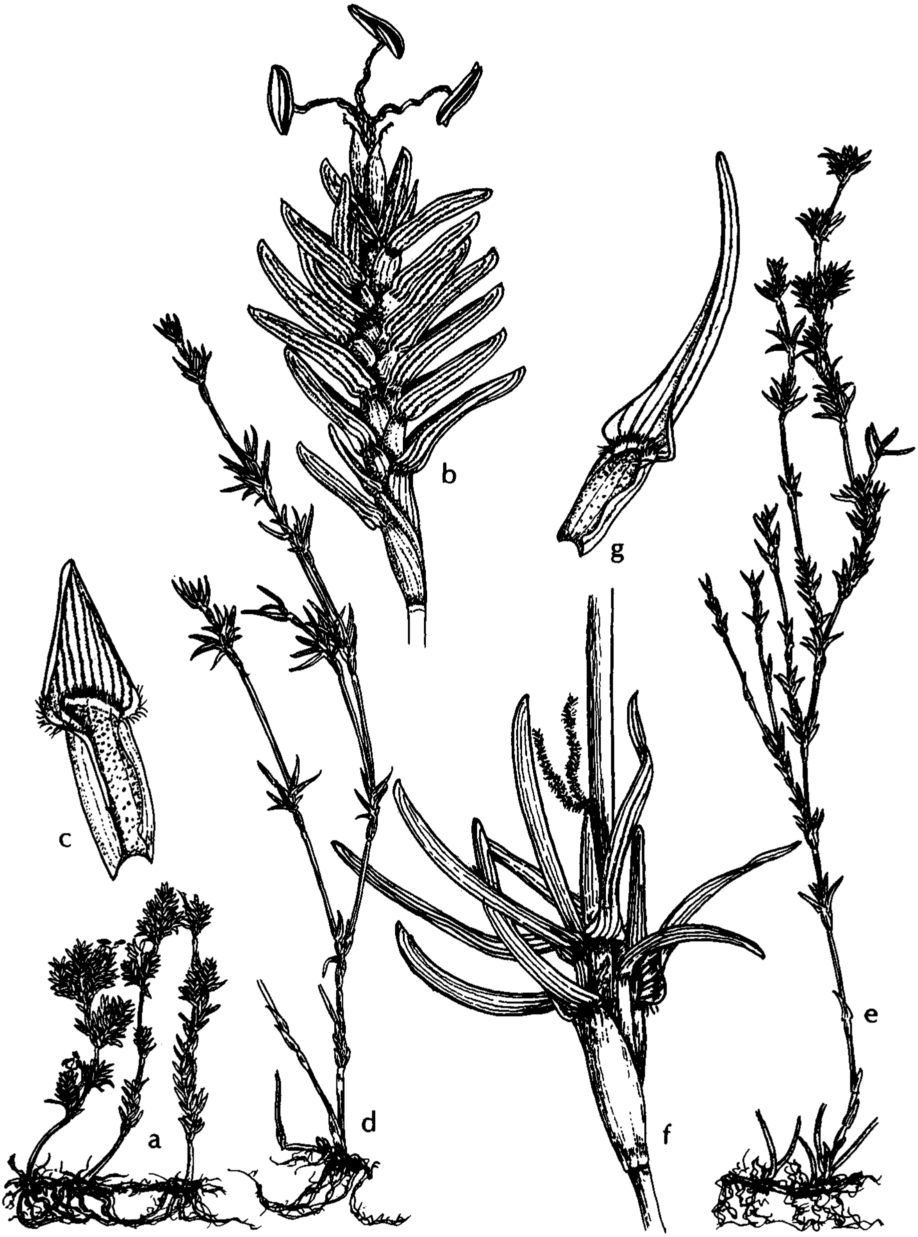

Fig. 118. **Monanthochloe littoralis:** a, habit, staminate plant; b, staminate inflorescence; c, leaf; d, habit, pistillate plant; e, habit later in the season, after flowering; f, pistillate inflorescence; g, leaf from plant after flowering. (From Correll and Correll)

3. Undivided basal portion of the awn (the column) spirally twisted, 1.5–2.5 cm long. 3. *A. spiciformis*

3. Undivided portion of awn, if any, very short.

4. Central awn, at least, with a hairpinlike bend at base, all 3 awns spreading at right angles or central one somewhat reflexed. 4. *A. tenuispica*

4. Central awn with at most a right-angle bend, the laterals usually ascending.

5. Lemma 6.5–8.0 mm long. 5. *A. affinis*

5. Lemma 3.5–5.0 mm long. 6. *A. virgata*

1. Aristida stricta Michx. WIREGRASS. Fig. 119

Perennial, forming relatively large clumps. Stems 7–12 dm tall (though flowering only after burning). Leaves mostly near the base, the blades stiff, tightly folded together lengthwise, to 5 dm long, 1 mm wide, more or less villous when young, at maturity villous at least on the upper surface at or near the base of the blade, sometimes about the summit of the sheath. Panicles narrow, spikelets clustered on short, appressed branchlets. Glumes subequal, 1-nerved, long-tapered and with awns 1–3 mm long, the awn often from between a shortly bifid apex. Awns of the lemma about equal, 8–10 mm long, when fully mature slightly twisted basally, the lateral awns usually diverging at right angles, the central ascending.

Tolerant of a wide range of moisture conditions, an associate of longleaf pine (and in some places of slash pine) on well drained ridges or hills and seasonally wet pine savannas and flatwoods; also in open areas permanently boggy; not known to recolonize places from which it has been removed. Chiefly coastal plain, N.C. to s. cen. Fla., w. to Miss.

2. Aristida patula Nash. Fig. 119

Short-rhizomatous perennial. Stems to about 1 m tall. Leaves chiefly at or near the base, the blades flat below, 2–4 mm wide, very long-tapering and involute above. Inflorescence a widely branched loose open lax panicle, the branches finely wiry, relatively long, flexuous and pendulous, spikelets a few in clusters on long-stalked filiform ultimate branchlets. Glumes nearly equal, green to brown or purplish brown, 10–15 mm long, one dropping early, 1-nerved, tapering gradually to a long narrow point. Central awn straight, very much longer than the laterals, 2.0–2.5 cm long, the laterals 0.5–1.2 cm long, straight and close to the central one.

Banks of rivers and marshes, alluvial deposits along streams, open pineland depressions, borders of hammocks, ditches, usually where well-drained, sometimes where temporarily wet. Cen. pen. Fla., northwestward into the Fla. Panhandle.

3. Aristida spiciformis Ell. Fig. 119

Tufted glabrous perennial. Stems stiffly erect, 5–8 dm tall. Leaf blades striate, stiff, somewhat rolled upward to folded tightly lengthwise, 1–2 mm wide, tapering to long points. Inflorescence a dense brushlike green to purplish brown panicle, 10–15 cm long and 1–8 cm broad including the spreading awns. Glumes unequal, the 1st 4–5 mm long, about half as long as the second, both awned, the awns 7–20 mm long; awn of the lemma with an undivided spirally twisted portion (column) 1.5–3.0 cm long, this very easily detached from the summit of the lemma body, the 3 divisions somewhat twisted basally, about equal, mostly 2–3 cm long, ascending to widely divergent.

Seasonally wet pine savannas and flatwoods, seepage slopes, occasionally in well-drained pinelands. Coastal plain, S.C. to cen. pen. Fla. and Miss.; Cuba, P.R.

4. Aristida tenuispica Hitchc. Fig. 119

Tufted perennial. Stems 6–10 dm tall. Leaf blades flat, flexuous, 1–2 mm wide. Inflorescence slender and spikelike, the spikelet clusters rather distant, somewhat overlapping. Glumes nearly equal, about 8 mm long, pointed; awns of the lemma 12–15 mm long, the central longer than the laterals, the central basally with a hairpinlike bend, the others bent at right angles.

Seasonally wet pine savannas and flatwoods. Pen. Fla.; Brit. Hond.

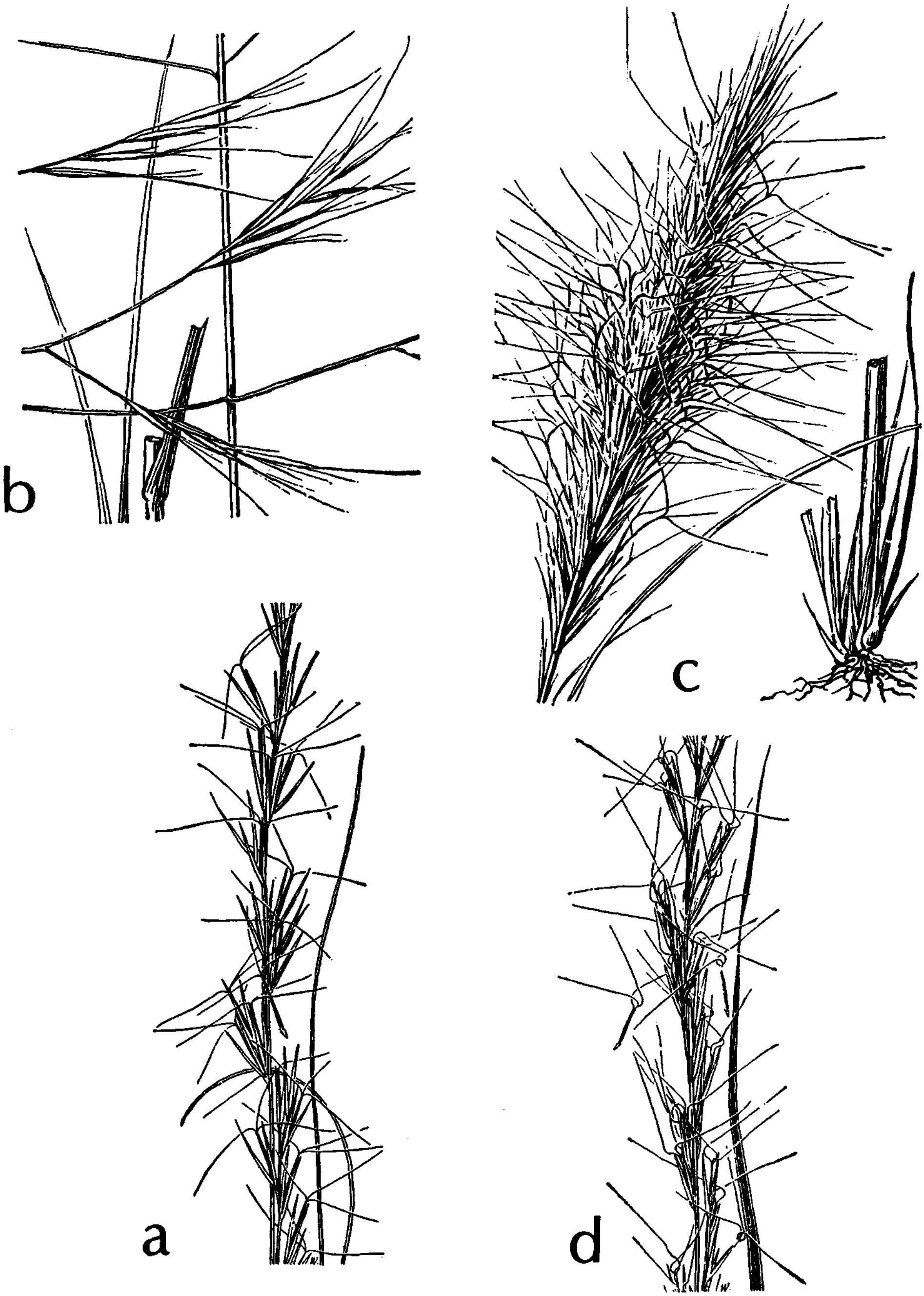

Fig. 119. a–b, parts of panicle of: a, **Aristida stricta**; b, **Aristida patula**; c, **Aristida spiciformis**: base of plant and panicle; d, **Aristida tenuispica**: portion of panicle. (From Hitchcock and Chase)

5. Aristida affinis (Schult.) Kunth. Fig. 120

Tufted perennial. Stems stiff, 7–10 dm tall. Leaf blades flat, tapered to long points, basally 2–2.5 mm wide. Panicle narrow, the spikelets few in clusters on short, appressed branchlets. Glumes somewhat unequal, mostly about 10 mm long, strongly keeled, narrowed to long sharp points. Lemmas 6.5–8.0 mm long, central awn bent basally and extending horizontally, 1.5–3 cm long, the laterals somewhat shorter, ascending.

Seasonally wet pine savannas and flatwoods, exposed shores of ponds, boggy places. Coastal plain, N.C. to Fla., w. to e. and s.e. Tex.; Ky.

6. Aristida virgata Trin. Fig. 120

Similar to the preceding, the glumes and lemmas shorter, the glumes 6–7 mm long, the lemmas 3.5–5.0 mm long.

Pine savannas and flatwoods, adjacent ditches; also in well-drained open woods. Coastal plain, s. N.J. to Fla., w. to e. and s.e. Tex.

The latter two of the above species, together with *A. purpurascens* Poir., which appears to occur on well-drained sites, are for us very difficult to distinguish one from the other.

47. Arrhenatherum

Arrhenatherum elatius (L.) Presl. TALL OATGRASS. Fig. 121

Tufted perennial. Stems 8–15 dm tall, striate, the nodes smooth or minutely pubescent. Leaf blades flat, flexuous, striate, 1–3 dm long, mostly 4–8 mm wide. Panicles terminal, lax, well exserted above the uppermost leaf, loose and open, 8–25 cm long, to 6 cm broad, stalked spikelets and short spikelet-bearing branches mostly in verticils from the main axis. Spikelets 2-flowered, 7–8 mm long, excluding awns, the lower floret staminate, the upper bisexual; first glume 1-nerved, about ⅔ as long as the spikelet, second as long as the spikelet, broader, 3-nerved, its lateral nerves not reaching the apex of the glume, both glumes acute. Lemma of the lower staminate floret bearing an awn from near the base on the back, the awn well exserted from the spikelet, bent about midway, twisted spirally below the bend; lemma of the upper floret with a minute awn from the back just below the acute tip and not exceeding the tip. Disarticulation is above the glumes.

Meadows, moist roadsides and waste places. Introduced from Europe, cultivated as a meadow grass, naturalized in various parts of Canada and the U.S.; in the East s. to Ga. and Tenn.

48. Arundinaria

Arundinaria gigantea (Walt.) Muhl. CANE. Fig. 122

"Woody" perennial with hard, tough rhizomes, forming open or dense brakes. Stems 1–8 m tall, 2–20 mm thick; at first unbranched, later freely branching, forming fanlike fascicles, the basal shoots and primary branches with loose papery sheaths bearing short, narrow blades without petioles; toward the ends several petiolate blades 1–3 dm long, their sheaths overlapping; sheaths bearing several flat, scabrous bristles on either side at the summit, these shed in age. Flowering branches borne on the main stem, on primary branches, or on flowering shoots arising from the rhizomes, the latter mostly with bladeless sheaths. Spikelets solitary or usually in racemes or panicles, about 8–12-flowered, usually on long slender stalks. Glumes 5–9-nerved, unequal, apically acute or obtuse, usually pubescent apically. Lemmas 11–17-nerved, papery, acute, acuminate, mucronate, or awn-tipped. Flowering occurs at infrequent intervals (of unknown length), the flowering stems dying after maturation of the seeds.

Arundinaria of the eastern United States has been variously interpreted taxonomically. The most recent analysis is that of F. A. McClure (edited by Thomas R. Soder-

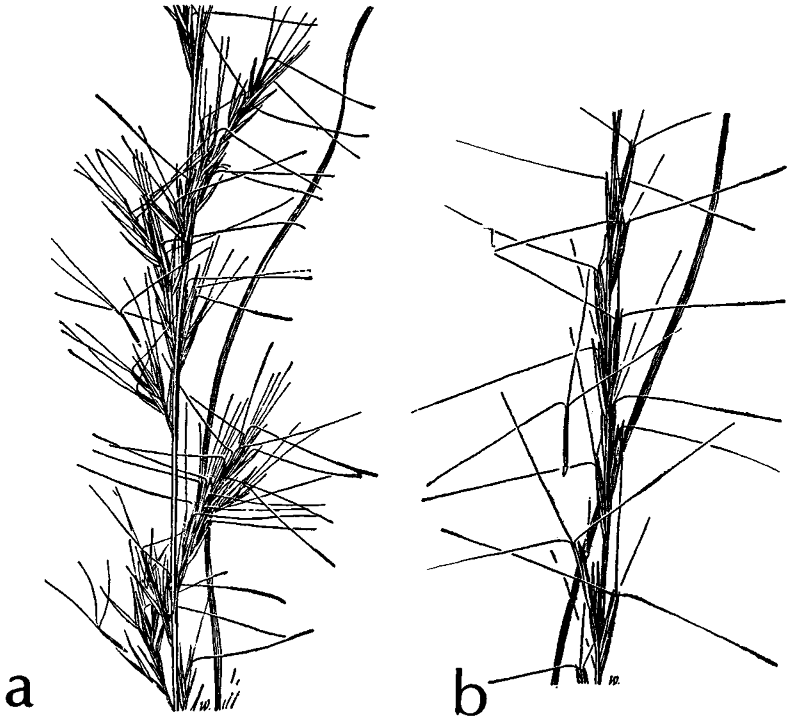

Fig. 120. Parts of panicles: a, **Aristida virgata**; b, **Aristida affinis.** (From Hitchcock and Chase)

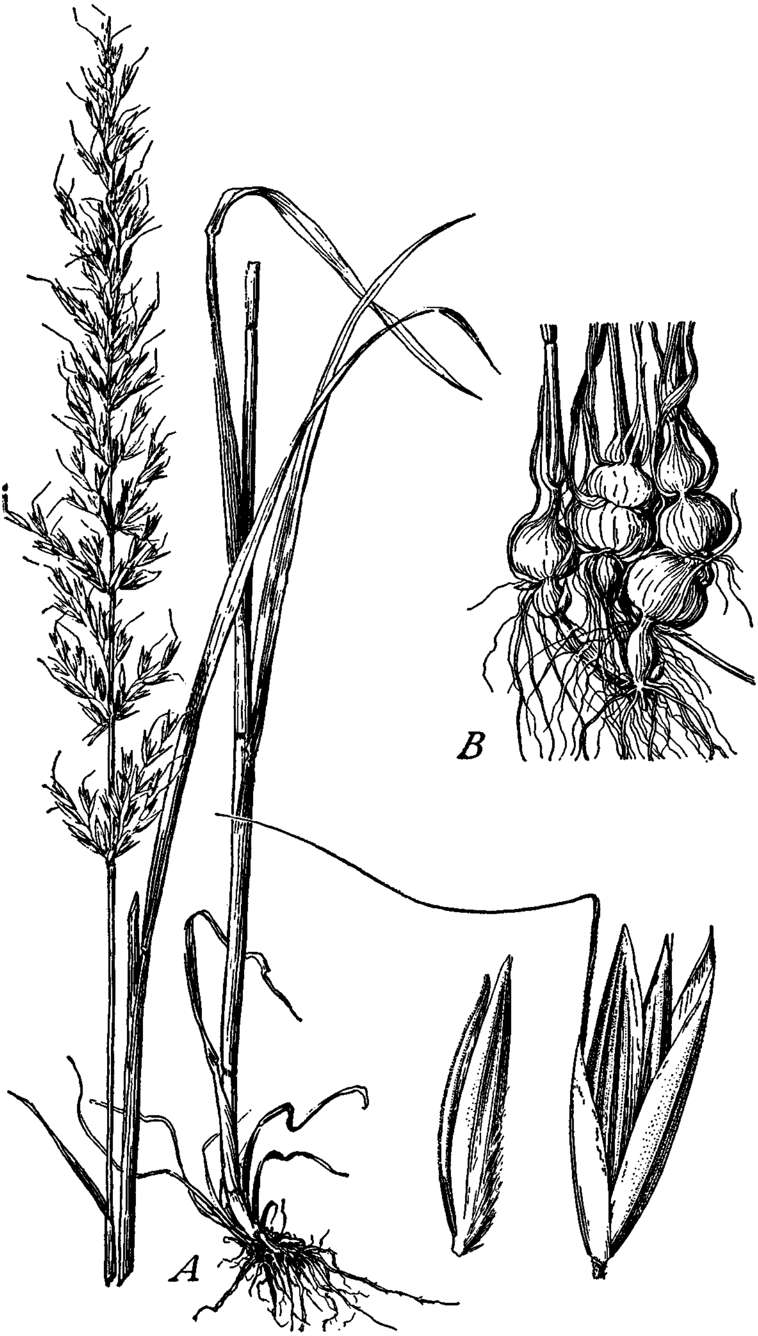

Fig. 121. **Arrhenatherum elatius:** A, habit, upper floret and spikelet; B, basal corms of an occasionally introduced form. (From Hitchcock and Chase)

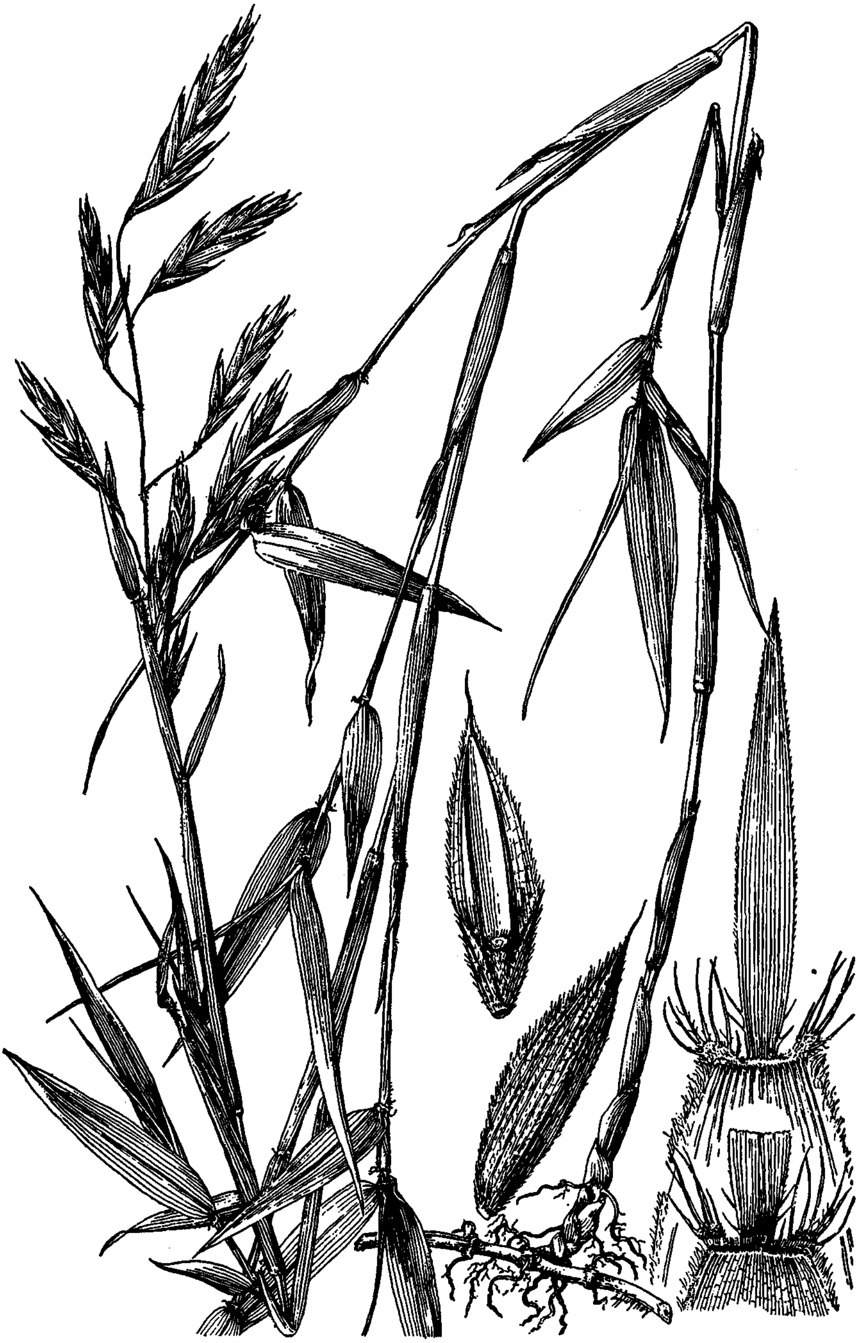

Fig. 122. **Arundinaria gigantea:** habit, summit of stem sheath, outer and inner face showing auricles and ligule (lower right), floret (two views, lower center). (From Hitchcock and Chase)

strom) in "Genera of Bamboos Native to the New World (Gramineae: Bambusoideae)," Smithsonian Contributions to Botany, number 9, 1973. McClure recognizes *A. gigantea* as comprised of three subspecies, *A. gigantea* ssp. *gigantea*, *A. gigantea* ssp. *tecta* (Walt.) McClure, and *A. gigantea* ssp. *macrosperma* (Michx.) McClure. The treatment and discussion in the reference cited above leaves little doubt that a considerable experience is necessary for one to achieve any appreciable understanding of this plant. Suffice it to say we do not have sufficient understanding, based upon personal experience, to attempt to convey any to the reader.

Generally, though by no means exclusively, inhabiting low-lying, moist to wet places, low woodlands, of various vegetation mixes and ranges of moisture conditions, river and stream banks, shrub bogs, sloughs and bayous. S. Md. and Va., s. Ohio, s. Ind., s. Ill., s. Mo., generally southward to n. Fla., e. and s.e. Tex.

49. Oryza

Oryza sativa L. RICE. Fig. 123

Tufted annual, variable in stature, robust specimens to 2 m tall, the stems to 2 cm across basally. Leaf blades 1–6 dm long, 5–15 mm broad, flat, striate, smooth above and finely scabrid below and on the margins; uppermost leaf usually exceeding the panicle. Ligule a 2-lobed, sometimes lacerate, stiff scale. Inflorescence an open panicle, 15–20 cm long, its branches lax and somewhat drooping when fully mature. Spikelets very short-stalked, 1-flowered, flat, 7–9 mm long excluding the awn if any; lowermost parts of the spikelet 2, small and scalelike, inserted just above cuplike summit of spikelet stalk and below knoblike base of floret; greater portion of spikelet comprised of fertile lemma and palea, surfaces of these very finely papillose-lined, clear trichomes as well; fertile lemma in some cultivars strongly awned. Disarticulation is below the lowermost scalelike structures.

Native to Old World tropics. In our range sporadically spontaneous in ditches and other seasonally wet places in rice growing areas; apparently occasional plants still volunteering in near-coastal marshes where rice was grown long ago.

50. Leersia

Perennial, most with rhizomes and often forming clones. Leaf blades flat, scabrous in most. Ligule a membranous scalelike collar. Inflorescence an open or congested panicle, the spikelets subsessile to short-pedicillate on the slender panicle branches, disarticulating from the pedicel below a short stipelike base. Spikelets strongly flattened laterally, 1-flowered; glumes absent, with a lemma and palea of nearly equal length; lemma and palea both flattened longitudinally from the midrib so that they are like narrow boats, the palea much narrower than the lemma, the sides of the lemma overlap those of the palea like one boat fitting upside down in the other.

1. Lower panicle branches whorled, or at least several approximate, the upper alternate. 1. *L. oryzoides*
1. Lower (all) the panicle branches alternate, or the lowermost opposite.
    2. Spikelets broadly oval-falcate, about 5 mm long and 3 mm wide, obtuse; principal leaf blades 1–1.5 cm wide. 2. *L. lenticularis*
    2. Spikelets oblong or lance-oblong-falcate, not exceeding 4.5 mm long and little if any over 1 mm wide; principal leaf blades usually not more than 0.7 cm wide.
        3. The spikelets 4.0–4.5 mm long and 1.0 mm wide or a little wider; panicle branches short and with spikelets from the base of the branch or nearly from the base. 3. *L. hexandra*
        3. The spikelets 3.0 mm long and not exceeding 1 mm wide; panicle branches diffuse, long and filiform, the longer ones, at least, spikelet-bearing only from about their midpoints upwards. 4. *L. virginica*

1. **Leersia oryzoides** (L.) Swartz. RICE CUTGRASS. Fig. 124

Stems weak, up to 1.5 m tall, in tufts or forming clones, the lower portions often

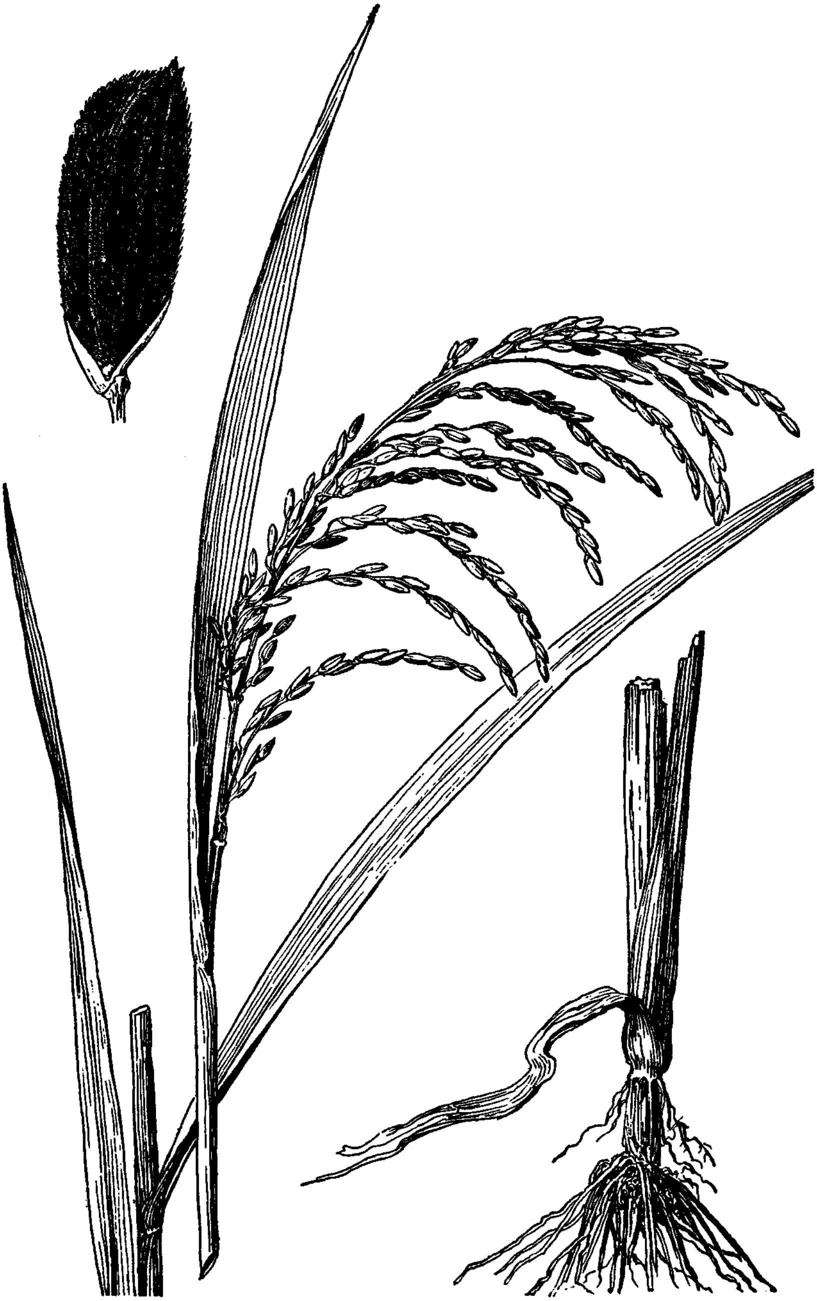

Fig. 123. **Oryza sativa:** base of plant, midsection of stem, panicle, and spikelet. (From Hitchcock and Chase)

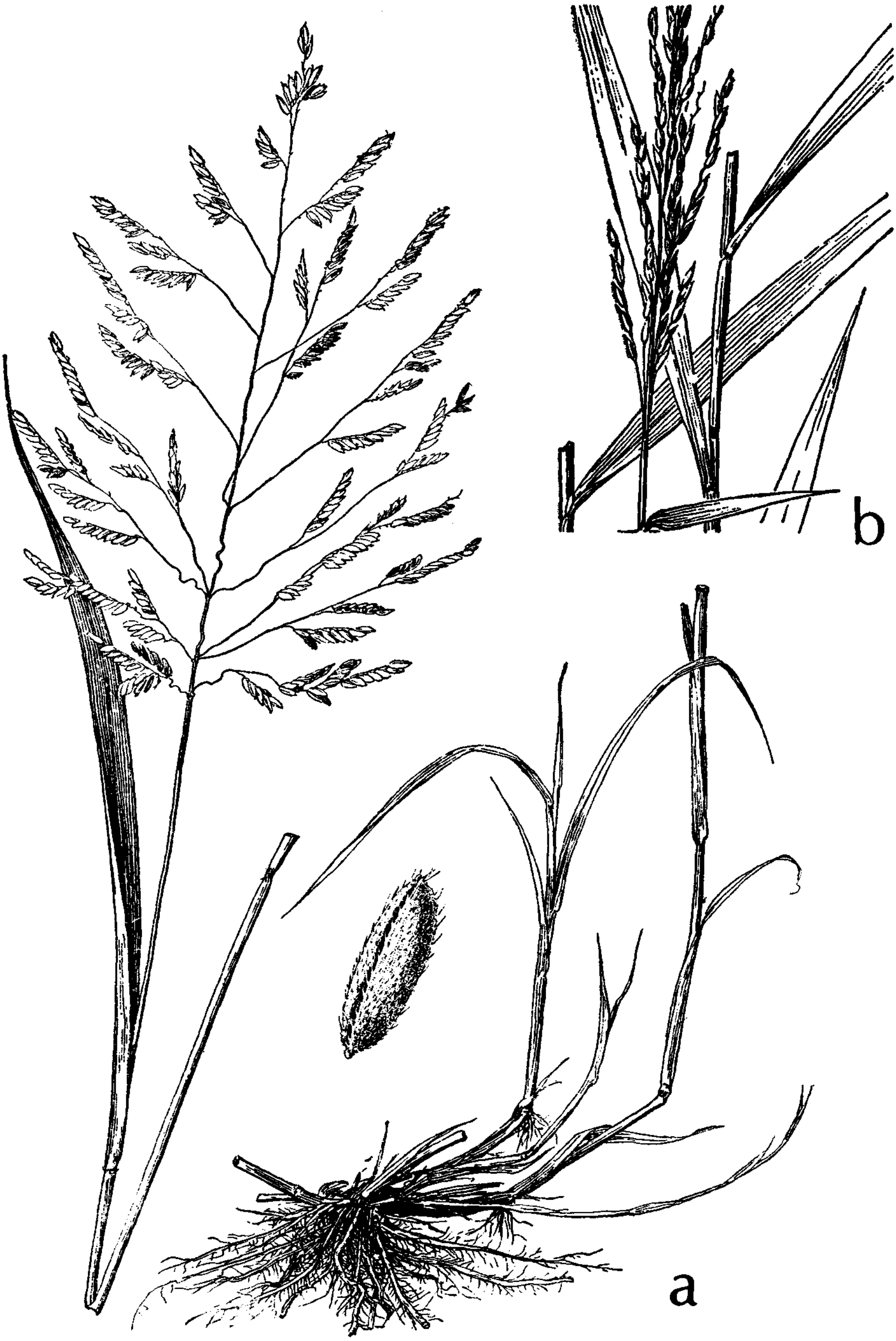

Fig. 124. a, **Leersia oryzoides:** plant and spikelet; b, **Leersia hexandra.** (From Hitchcock and Chase)

decumbent and rooting at the nodes; striate, glabrous, or rarely sparsely pubescent, but with a densely short-hairy band at the nodes. Principal leaf blades elongate, mostly 5–10 mm wide; blades and sheaths striate, scabrous, the margins of the blades with distant, prominent, spiculelike teeth. Panicle diffuse, the branches flexuous, the primary ones not bearing spikelets from their bases, the lowermost whorled or approximately so, thence alternate upward. Axillary panicles not wholly exserted from the leaf sheaths.

Wet sites, marshes, river shores, drainage ditches and canals, shores of lakes and ponds. A widespread species, occurring in much of the U.S. and s. Can.; Europe.

2. **Leersia lenticularis** Michx. CATCHFLY GRASS. Fig. 125

Stems weak and straggly, often decumbent, to 1.5 m tall, forming small tufts or spreading by rhizomes; striate, glabrous except for a band of short dense hairs at the nodes and on a rather limited zone of the surface on either side of this band. Principal leaf blades elongate, to 30 cm long or longer, lax, mostly 1–1.5 cm wide; blades and sheaths smooth to scabrous, the upper portions of the sheaths commonly more pubescent than the lower, the hairs stiff and retrorse; usually abundant short-soft pubescent about the junction of the sheath and the blade, the blade margins with fairly numerous, fine, spiculelike antrorse teeth. Panicle open, the branches flexuous, the primary branches alternate, or the lowermost opposite, mostly departing from the axis at right angles and spikelet-bearing on their upper portions or on the secondary branches.

Floodplain forests, swamps, and occasionally in wet ditches. Md. to Fla. Panhandle, to e. Tex., in the central states to Ind. and Minn.

3. **Leersia hexandra** Swartz. Fig. 124

Stems slender and weak, often decumbent at the base and rooting at the nodes, with slender rhizomes and leafy stolons; smooth to striate, glabrous except for a band of short dense hairs at the nodes. Principal leaf blades narrow, usually not exceeding 15–18 cm long and 3–6 mm wide; blades and sheaths smooth to retrorsely scabrous, the margins of the blades finely but sharply toothed. Panicle narrow, 5–10 cm long, mostly with ascending, alternate, primary branches only, these to about 2–3 cm long and bearing spikelets to or nearly to their bases.

Frequently in water, sometimes as much as 1.8 m deep, marshy shores of ponds, lakes or streams, in swamps, ditches, or drainage canals, often in floating islands of vegetation. Coastal plain, Va. to Fla., westward to s.e. Tex. and Tenn.; widespread in the tropics of both hemispheres.

4. **Leersia virginica** Willd. WHITE-GRASS.

Stems slender and weak, freely branching, often straggling and the branches much entangled; striate, smooth to touch but with very short scabrous pubescence between the striations, a band of short dense hairs at the nodes. Principal leaf blades relatively short, mostly 8–15 cm long and 4–7 mm wide, thin and flexuous; blades and sheaths striate, very short-scabrous pubescent, the blade margins very finely scabrous. Panicles both terminal and axillary, the latter not fully exserted from their sheaths; loose and open, with spreading-ascending primary branches, all branches very slender and flexuous, bearing spikelets on their upper portions.

Lowland woodlands, floodplain woodlands, moist to wet or marshy stream banks, and swamps. N.E. to Ont., Minn. and Nebr., throughout the eastern states southward.

51. Zizania

Zizania aquatica L. WILDRICE. Fig. 126

Coarse and robust plant, in our range mostly perennial (annual northward and westward), to 3 m tall, often decumbent below and rooting at the nodes. Stems thick and spongy. Principal leaves 4–5 cm wide at their widest places, flat, to 1 m long or a little longer, glabrous except for the finely, sharply toothed margins. Panicles very handsome,

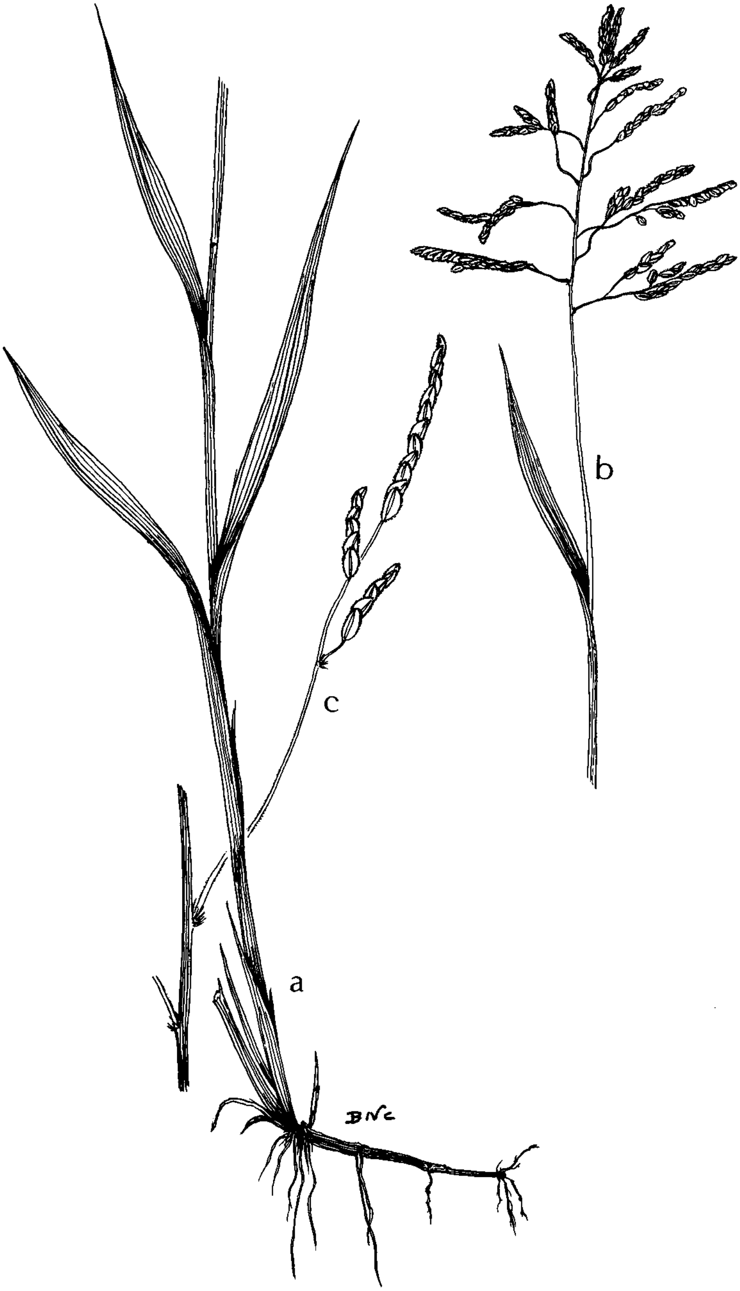

Fig. 125. **Leersia lenticularis:** a, lower portion of plant; b, panicle; c, part of panicle.

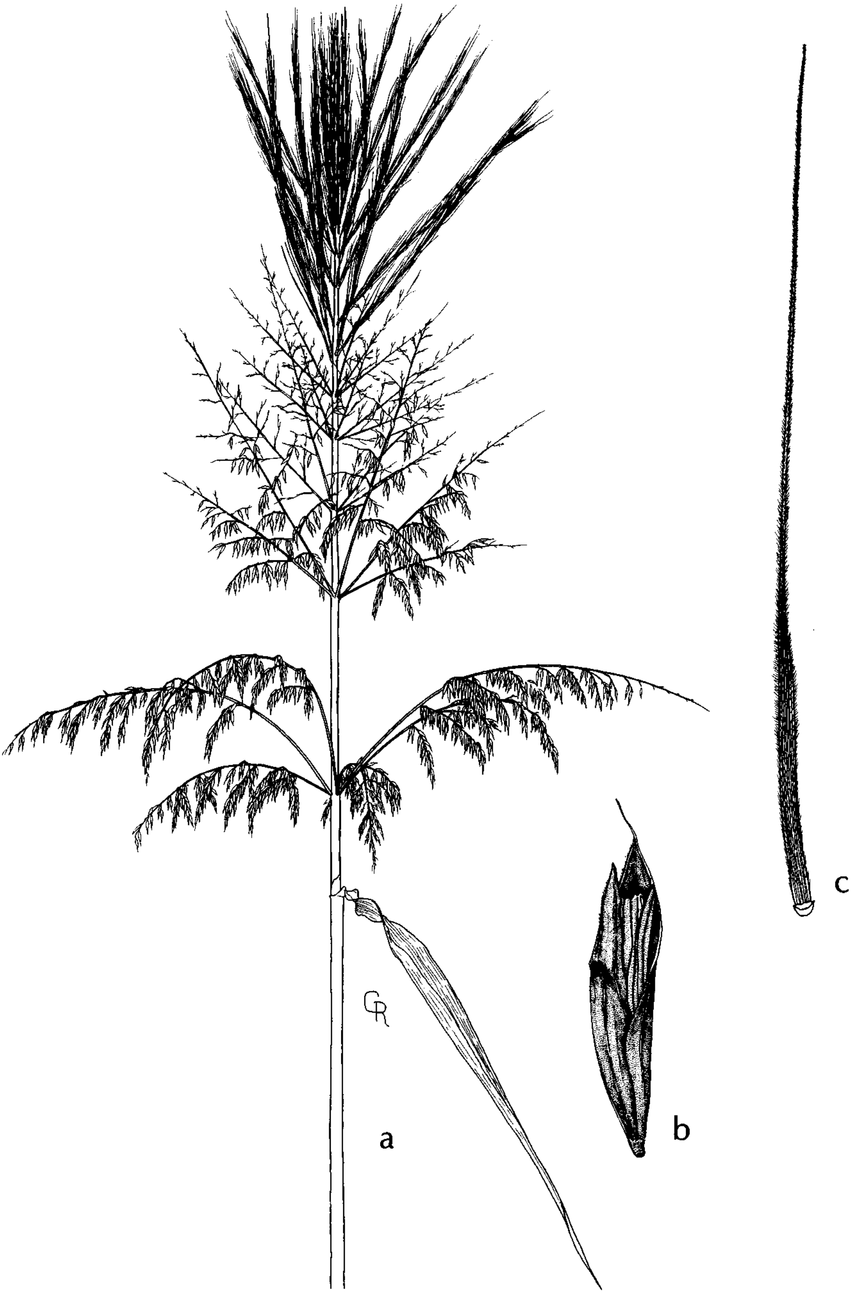

Fig. 126. **Zizania aquatica:** a, panicle; b, staminate spikelet; c, pistillate spikelet.

large, terminal, 4–6 dm long and to 3 dm broad below, the lower branches widely spreading, their branchlets pendulous and bearing quickly deciduous staminate spikelets, the upper branches simple, stiffly ascending and bearing appressed pistillate spikelets.

Usually in water, marshes and marshy shores, quiet waters of streams. Que. to N.Dak., s. to n. Fla. and Tex.; Idaho, Ariz.

In our range, plants are as described and occur mostly in the coastal plain; elsewhere there are, in addition, described varieties.

52. Zizaniopsis

Zizaniopsis miliacea (Michx.) Doell. & Asch.
WATER MILLET, GIANT CUTGRASS, SOUTHERN WILDRICE. Fig. 127

Coarse perennial with scaly rhizomes, commonly forming extensive dense colonies. Stems 1–3 m tall, glabrous, leafy, commonly rooting at the lower nodes, usually unbranched. Leaf blades flat, to 1 m long and 4 cm broad, surfaces striate, glabrous, margins finely and sharply scabrid. Inflorescence a large open panicle to 6 dm long and about 15 cm broad, the branches ascending, branchlets flexuous; lower branches whorled, becoming alternate above; on each branch staminate spikelets below, pistillate above, similar in general appearance. Spikelets 1-flowered, stalked, without glumes, 6–8 mm long (excluding awns), not compressed, lanceolate; lemma 7-nerved, that of the pistillate spikelet with an awn 3–6 mm long, palea 3-nerved. Disarticulation is below the floret.

Usually in shallow water, fresh to brackish, marshes, sloughs, ditches, shores of ponds, lakes and streams, swamp forests. Sometimes objectionable in clogging waterways and impoundments. Md. to s. Fla., w. to Tex., n. to Ky., Ark., Okla., s.e. Mo.

53. Hydrochloa

Hydrochloa caroliniensis Beauv. Fig. 128

A mostly submersed, slender, weak-stemmed, bottom-rooted perennial, with rhizomes and stolons and often long freely branching vertical stems whose leafy upper branches are more or less entwined and form floating mats, the leafy tips ascending from the water surface. Leaf blades flat, short, mostly about 2–3 cm long and 2–4 mm wide, the sheaths and blades striate, glabrous except for a few long hairs sometimes at the junction of the sheath and blade; ligule a white membranous, collarlike scale, usually with an uneven or torn upper edge. Inflorescences inconspicuous and infrequent, the spikelets unisexual, 1–few-flowered, the staminate terminating the branches, the pistillate subterminal in the leaf axils; glumes absent; staminate spikelets about 4 mm long, with a thin 7-nerved lemma, a 2-nerved palea, stamens 6; pistillate spikelet with a thin 7-nerved lemma, a 5-nerved palea. Disarticulation is below the floret.

Ponds, lakes, pools, swamps, and sluggish streams, sometimes in water as much as 1 m deep. N.C. to s. Fla., westward to e. Tex.; Mex.

54. Arundo

Arundo donax L. GIANT REED. Fig. 129

Very coarse canelike grass perennating by stout rhizomes and forming large clumps. Stems to 6 m tall, 5 cm thick, erect, little branched, if any. Leaves numerous and conspicuously 2-ranked, sheaths overlapping, the blades coarse, to 6 dm long and 5 cm broad, stiff, the long-tapering upper portions commonly nodding-recurved; blades white-striped in some cultivars. Inflorescence a large plumelike dense panicle, elliptical in overall outline, to 6 dm long.

Native to the Old World. Commonly cultivated for ornament or screening, some-

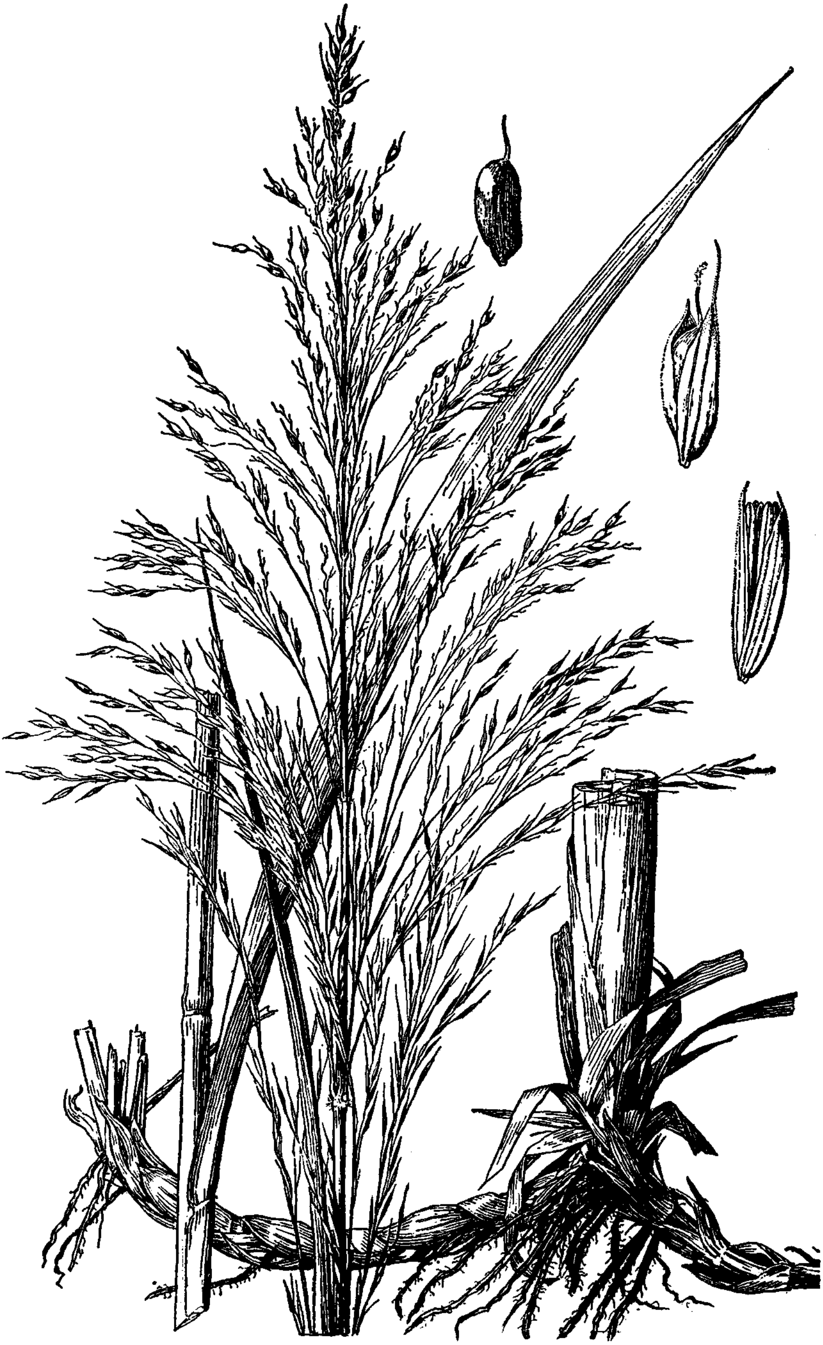

Fig. 127. **Zizaniopsis miliacea:** parts of plant, staminate spikelet (lower), pistillate spikelet (center), grain (upper). (From Hitchcock and Chase)

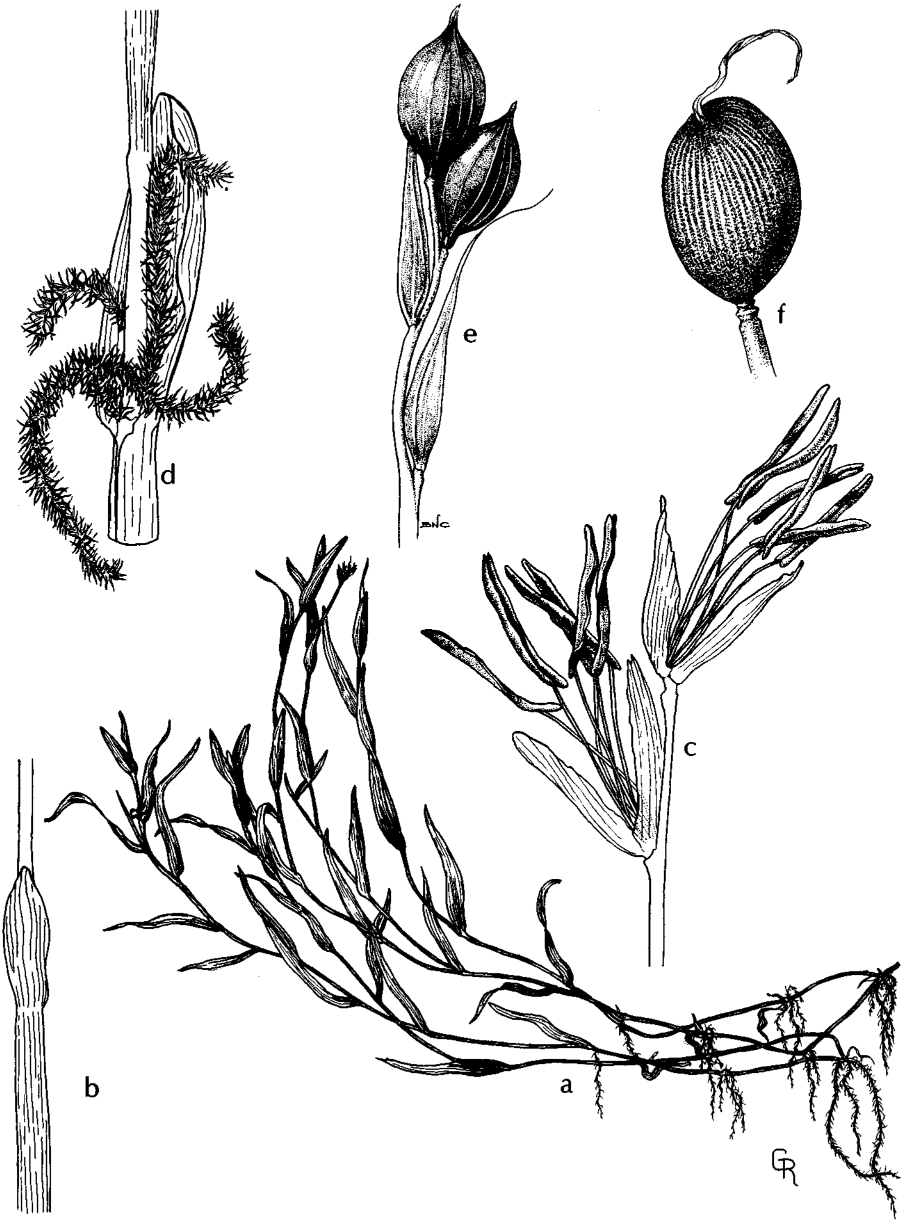

Fig. 128. **Hydrochloa carolinensis:** a, habit; b, beginning of formation of staminate spikelet; c, staminate spikelets; d, pistillate spikelet at anthesis; e, mature pistillate spikelets; f, grain.

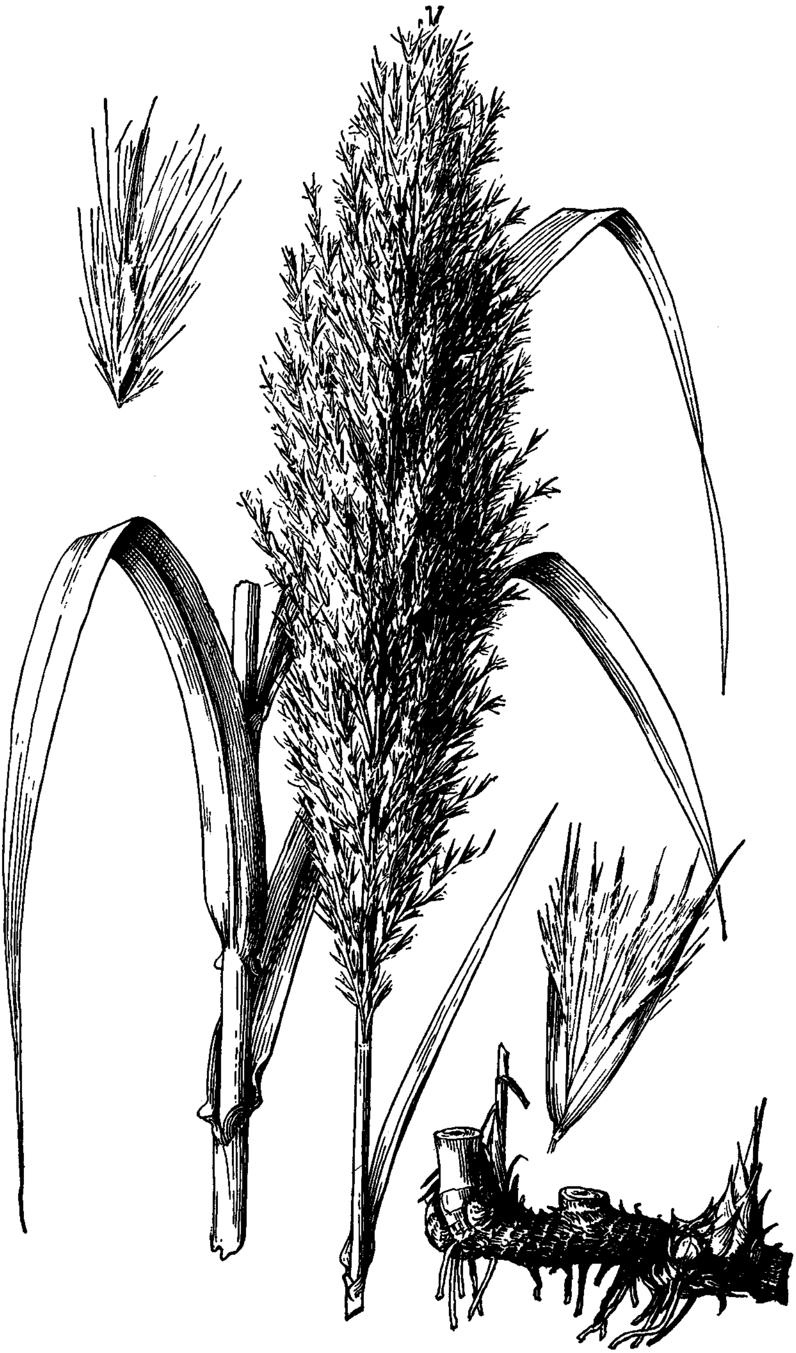

Fig. 129. **Arundo donax:** rhizome, midsection of stem, panicle, spikelet and floret. (From Hitchcock and Chase)

times for erosion control. Mostly in the coastal plain and piedmont; Va. to Ky. and Mo., generally southward. Long persisting about abandoned house sites; naturalizing to some extent in southern part of the range, Fla. to Tex., in open moist to wet or seasonally wet places.

55. Phragmites

Phragmites australis (Cav.) Trin. ex Steud. COMMON REED. Fig. 130

Tall, coarse perennial with stout rhizomes to 2 cm across, deep seated in the substrate, forming extensive colonies. Stems mostly 2–3 m tall or taller, 5–15 mm thick, leafy throughout, the sheaths overlapping, with a large, dense terminal panicle. Leaves flat, stiff, striate, 1–4 (–6) cm broad and to 6 dm long, gradually tapering to long-attenuate tips, smooth except for low, smoothish marginally appressed teeth; ligule a ring of dense short stiff hairs. Panicle plumelike, tawny to purplish or silvery, many-branched and with spikelets densely disposed. Spikelets 12–15 mm long, flattish, on filiform stalks 8–10 cm long, loosely 3–7-flowered, the lower florets staminate or the chaff empty; glumes very unequal in length, both much shorter than lemmas, lanceolate, long-acute; lemmas narrow, very long tapered; axis of spikelet above lowest lemma bearing long silky hairs about as long as the florets. Disarticulation is above the glumes and below the lemma nodes, thus a dehisced portion consisting of a floret and a portion of the hairy axis below. (*P. communis* Trin.)

Some plants or colonies rarely perfect seed; they spread freely by rhizomes and long leafy stolons.

Locally abundant, marshes, shores, often in tidal waters, along streams and estuaries. Semicosmopolitan.

56. Neyraudia

Neyraudia reynaudiana (Kunth) Keng. SILK REED. Fig. 131

Reedlike perennial, reminiscent of *Phragmites*, the common reed. Basally with short, coarse scaly rhizomes and clump-forming. Stems to 3 m tall, nodes bluish. Leaf blades elongate, attenuate, mostly 1–2 cm wide, midrib thick, pale; sheaths woolly at the summit; ligule long-hairy. Inflorescence a large, densely flowered, plumelike panicle, branches nodding. Spikelet 4–8-flowered, its axis jointed; glumes unequal, 1-nerved; lemmas narrow, 3-nerved, pilose marginally, awned from between 2 small apical teeth, awns curved; two lowest lemmas empty.

Canal and marsh banks, waste places. Introduced from s. Asia as an ornamental, now naturalized in s. Fla.

57. Chasmanthium (SPIKEGRASSES, SPANGLEGRASSES)

Tufted or sparingly colonial, rhizomatous perennials. Stem simple or sparsely branched, lax. Leaf blades flat, marginally smooth or toothed; ligule a ring of hairs or a hyaline scale. Panicle open or contracted. Spikelets flat, 2–many-flowered, the florets closely overlapping at least at the base; Glumes equal to subequal, shorter than the lemmas, acute, 3–7-nerved, keeled, the keel smooth or toothed; lower 1–4 lemmas empty, 5–15-nerved, keeled, the keels smooth or toothed; paleas shorter than to exceeding the lemmas, 2-keeled. Disarticulation is above the glumes and between the florets.

1. Panicle with pendulous branches or spikelets; spikelets long-stalked, 6–17-flowered, 2–4 cm long. 1. *C. latifolium*
1. Panicles erect or ascending; spikelets sessile or short-stalked, 3–8-flowered, 0.5–1.8 cm long.
  2. Axils of panicle branches and axils of spikelets pilose. 2. *C. ornithorhynchum*
  2. Axils of panicle branches and axils of spikelets glabrous or at most very short-pubescent.
    3. Back of leaf at junction of sheath and blade (the collar) pubescent. 3. *C. sessiliflorum*
    3. Base of leaf at junction of blade and sheath (the collar) glabrous.

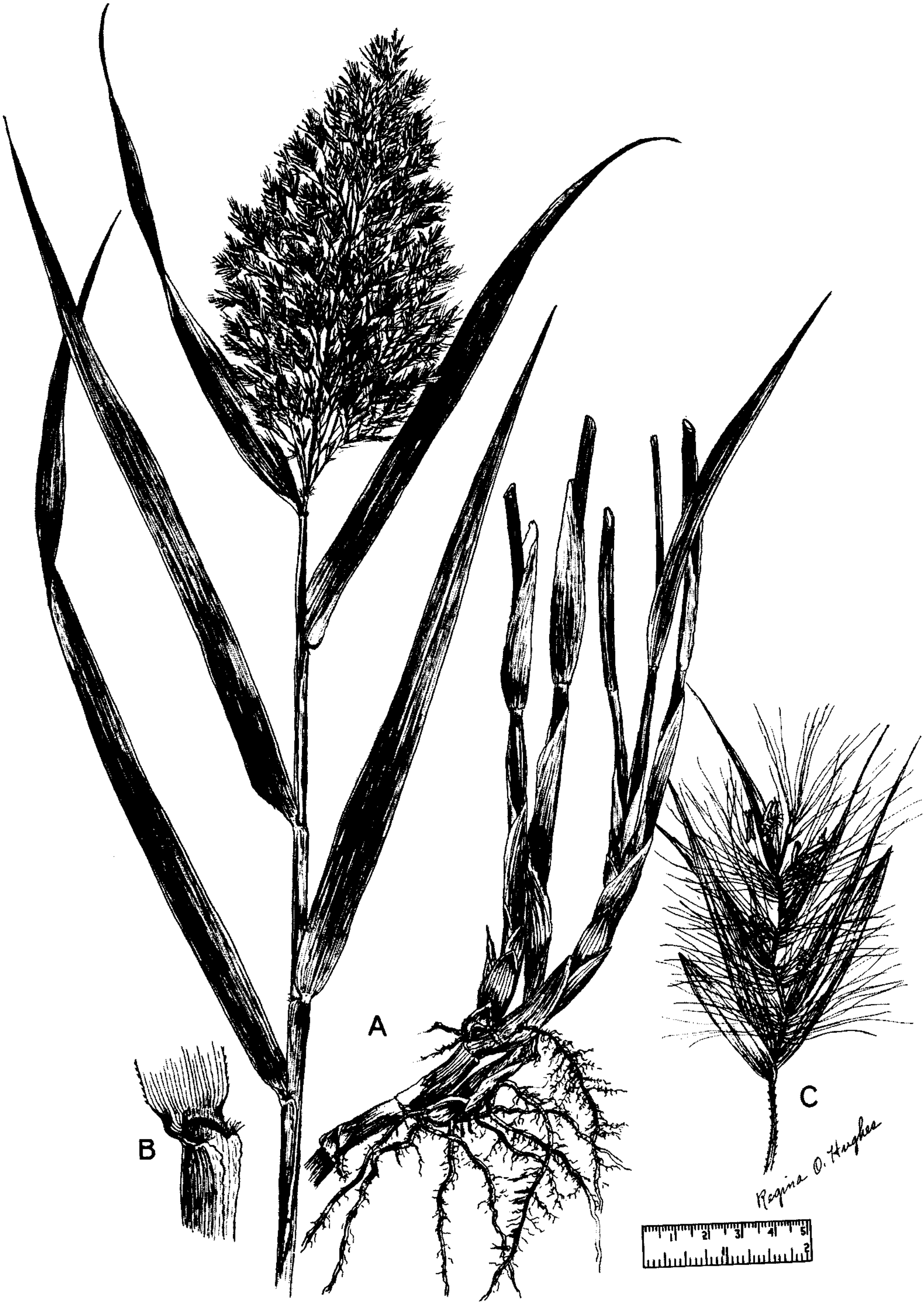
A
B
C
Regina O. Hughes

Fig. 130. **Phragmites australis:** A, base and summit of plant; B, ligule; C, spikelet. (From Reed, *Selected Weeds of the United States* (1970) Fig. 39)

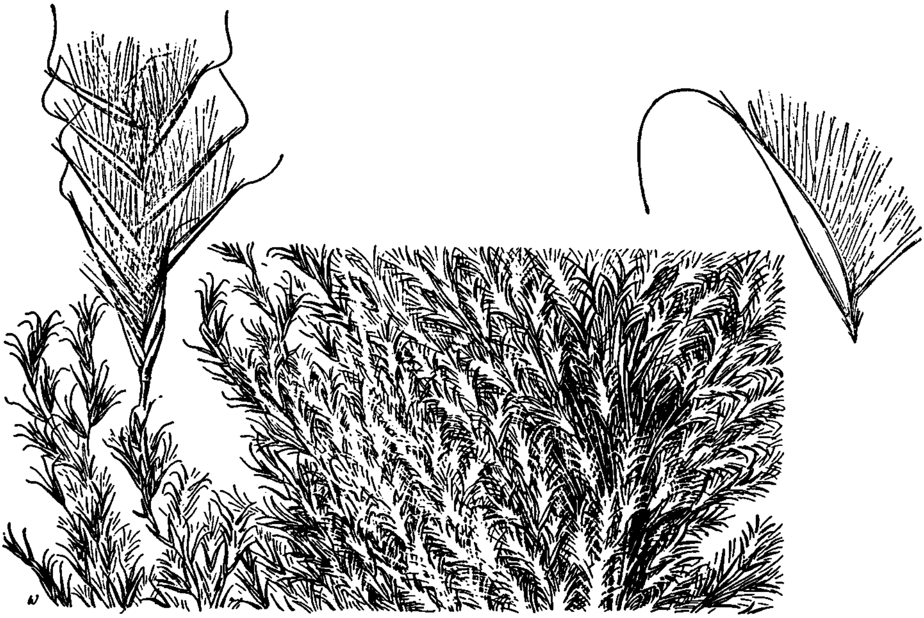

Fig. 131. **Neyraudia reynaudiana:** portion of panicle, spikelet, and floret. (From Hitchcock and Chase)

4. Spikelets, fully developed, mostly about 10 mm wide or a little wider and 15 mm long or a little more. 4. *C. nitidum*

4. Spikelets, fully developed, mostly not exceeding 5 mm wide and 5–7 mm long. 5. *C. laxum*

1. Chasmanthium latifolium (Michx.) Yates. Fig. 132

Slenderly rhizomatous, forming small colonies. Stems lax, 6–15 dm tall, unbranched, leafy to the base of the panicle, glabrous. Leaf sheaths shorter than the internodes, glabrous; blades striate, 1–2 dm long and to 2 cm wide. Panicles open, 15–30 cm long, with relatively long, filiform, lax branches, the spikelets broad and flat, oblong in outline, 1.5–3.0 cm long and 1–2 cm broad, 12–18-flowered, the glumes and lemmas closely overlapping; glumes much narrower than the lemmas, similar but unequal in length, both much shorter than the lowest lemmas, lanceolate-acute in side view; fertile lemmas lance-ovate, somewhat falcate, apices acuminate, the keels winged, very finely toothed. (*Uniola latifolia* Michx.)

Wooded stream and river banks, bottomland woodlands, shaded slopes. N.J. to s. Ohio, Ind., Ill. and Kan., generally southward to the Fla. Panhandle and cen. Tex.

2. Chasmanthium ornithorhynchum (Steud.) Yates. Fig. 133

Tuft-forming, with slender ascending rhizomes. Stems sometimes sparsely branched, to about 8 dm tall, nodes and internodes glabrous. Leaf sheaths glabrous or the margins ciliate; blades glabrous except near the ligule where ciliate, marginally smooth to very finely and minutely toothed, to about 5 mm wide; uppermost leaf sometimes as long as the panicle. Panicle with short branches, mostly bearing 1–3 spikelets, the lowermost sometimes with 4–7; panicle overall 3–10 cm long; axils of panicle branches and axils of spikelet stalks pilose. Spikelets mostly short-stalked, diverging from the axes almost at right angles; flat, 7–12 mm long and nearly as wide; glumes and 2–4 lower empty lemmas subequal, narrow, appressed, much shorter than the fertile lemmas; fertile lemmas somewhat overlapping basally, extending at right angles from the spikelet axis and separate distally; lanceolate, apically long-acuminate viewed from the side. (*Uniola ornithorhyncha* Steud.)

Stream banks, branch bays, lowland woodlands, on hummocks and enlarged bases of trees in swamps. Coastal plain, Fla. Panhandle to e. La.

3. Chasmanthium sessiliflorum (Poir.) Yates. Fig. 133

Loosely tufted, with short knotty rhizomes. Stems 5–10 (–15) dm tall, rather lax, leafy, the leaves mostly not reaching beyond the base of the panicle, glabrous or pubescent. Leaf sheaths somewhat overlapping, more or less pilose; back of the blade at junction of the sheath pubescent, blades otherwise glabrous, striate, to 4 dm long, 6–8 (–12) mm wide, long-tapering. Panicle 3–5 dm long, interrupted spikelike, with short branches bearing 2–3 spikelets, or sometimes larger branched below, the branches to 6–8 cm long, stiffly ascending. Spikelets 4–8 mm long and about as broad, roughly V-shaped, axils of panicle branches and of the spikelets glabrous; mostly 2–5-flowered; glumes short, stiff, long-triangular, with a similar sterile lemma above; fertile lemmas oblique-lanceolate, acuminate, seen in side view; florets closely set basally but spreading at nearly right angles and separated above. (*Uniola sessiliflora* Poir.; *U. longifolia* Scribn.)

Commonly abundant in upland mixed woodlands, in floodplain forest where flooding is temporary, stream and river banks, cabbage palm hammocks, prairies. S.e. Va. to Okla., generally southward to cen. Fla. and e. Tex.

4. Chasmanthium nitidum (Baldw. ex Ell.) Yates. Fig. 133

Slenderly rhizomatous and loosely colonial, sometimes abundant over extensive areas. Stems unbranched, 5–8 dm tall, glabrous, nodes purple, sheaths usually not overlapping, the uppermost leaf usually not reaching the panicle. Leaf sheaths striate, pubescent on the margins; back of the blade at junction of the sheath glabrous; blades mostly 2–5

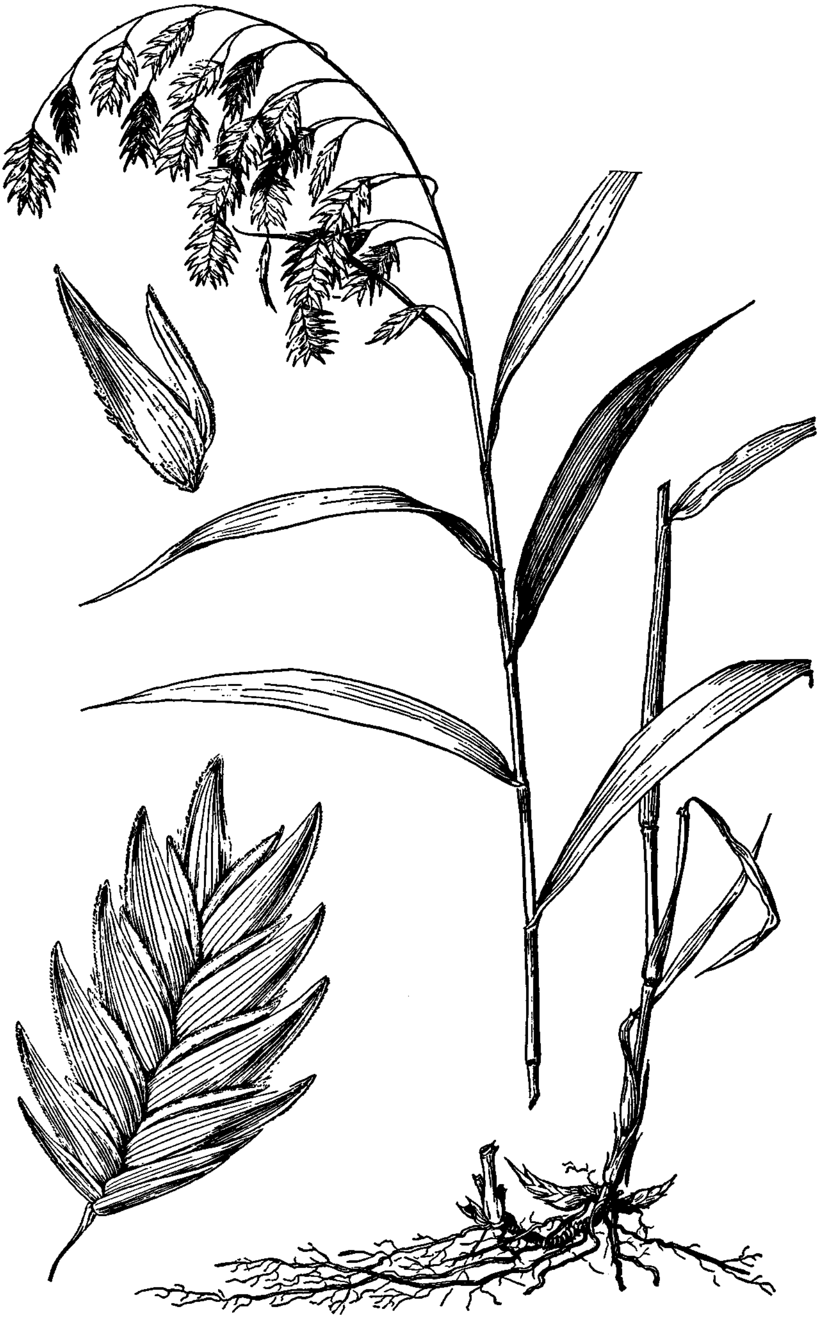

Fig. 132. **Chasmanthium latifolium:** habit, spikelet and floret. (From Hitchcock and Chase)

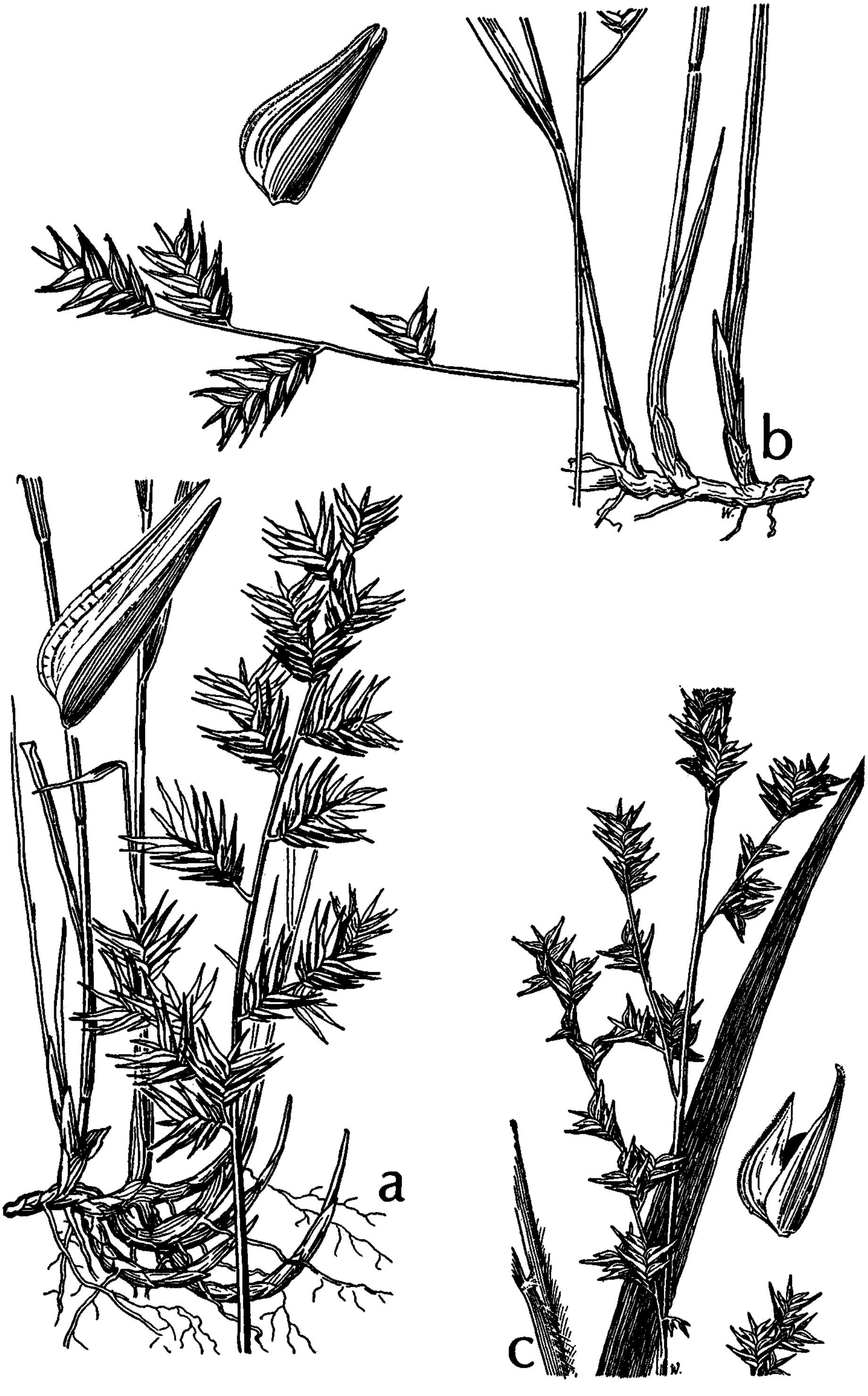

Fig. 133. Portions of plants and florets of: a, **Chasmanthium ornithorhynchum**; b, **Chasmanthium nitidum**; c, **Chasmanthium sessiliflorum.** (From Hitchcock and Chase)

mm wide, attenuate, striate, glabrous. Panicle open, 10–15 cm long, the branches ascending, spikelets relatively distant; axils of panicle branches and of the spikelets glabrous. Spikelets oblong, 4–8 (–11) flowered, sessile or short-stalked, 15 mm long or a little longer, 10 mm wide; glumes narrow, long-acute, one similar sterile lemma above; fertile lemmas lanceolate-acuminate seen in side view, overlapping basally then ascending at an angle, the florets separated above. (*Uniola nitida* Baldw. ex Ell.)

Stream and river banks, low moist to wet woodlands, often very abundant in wet hammocks, adjacent ditches and clearings. Coastal plain, S.C. to cen. pen. and cen. w. Fla., s.w. Ga., s.e. Ala.

5. **Chasmanthium laxum** (L.) Yates.

Tufted, with knotty rhizomes. Stems mostly 6–12 dm tall, relatively lax, unbranched, leafy, the sheaths mostly not overlapping, internodes glabrous, the nodes short-pubescent. Leaf sheaths glabrous, striate, the blades to 3 dm long, 2–7 mm wide, glabrous except for a few long hairs basally. Panicle with slender closely ascending branches, the spikelets sessile or short-stalked, ascending. Spikelets narrowly oblong, mostly 3–5-flowered (sometimes fewer or more), 5–7 mm long and 3–5 mm wide; glumes long-triangular, 2–3 similar sterile lemmas above; fertile lemmas loosely overlapping, ascending, lanceolate-acuminate seen in side view. (*Uniola laxa* (L.) BSP.)

Moist woodlands, wet woodlands or swamps, stream and river banks, pine savannas and flatwoods, adjacent ditches and clearings. Coastal plain, L.I. to s. cen. Fla., generally westward from N.C. to s.e. Mo., Ark., and e. Tex.

Cyperaceae (SEDGE FAMILY)

Annual or perennial herbs, mostly grasslike or rushlike. Stems solid (rarely hollow), mostly 3-angled, sometimes terete or nearly so. Leaves alternate, 3-ranked, sheaths closed below the orifice and tubular; in some, leaves of bladeless sheaths only, in some of both bladeless sheaths and with expanded blades, in some all with blades. Flowers bisexual or unisexual, mostly grouped into spikelets, each flower subtended by an abaxial scale (rarely 2 scales). Perianth of bristles or scales or both, or absent. Ovary 1-locular, bearing 1 ovule, fruit an achene. Style 2-cleft and fruit lenticular, or 3-cleft and fruit 3-angled.

1. Achene (or at anthesis pistillate flower except for a portion of the style and/or the stigma) borne within a sac, the perigynium, which is closed except for a terminal orifice through which style or stigma protrudes. 20. *Carex*

1. Achene not enclosed in a sac.

2. The achene with a white or whitish, bony, crustaceous, hard outer covering, not tubercled at the summit.

3. Perianth of 3–6 scabrous or plumose bristles. 18. *Schoenus*

3. Perianth absent. 19. *Scleria*

2. The achene not white or whitish, or if whitish then with a tubercle at the summit.

4. Perianth of 3 stalked scalelike or paddlelike structures, with or without a bristle between each. 12. *Fuirena*

4. Perianth of bristles or plumose structures, or absent.

5. Style base enlarged, becoming hard and persisting on the summit of the achene as a tubercle.

6. Leaves consisting of bladeless sheaths only. 8. *Eleocharis*

6. Leaves, some of them at least, with blades.

7. Inflorescence subtended by leaflike bracts which are white basally, green distally. 13. *Dichromena*

7. Inflorescence without bracts as described.

8. Perianth of many slender, elongate silky or woolly bristles. 10. *Eriophorum*

8. Perianth, if present, not of numerous silky or woolly bristles.

9. Spikelets 1–2-flowered. 15. *Rhynchospora*

9. Spikelets several–many-flowered.

10. Leaf blades very narrow, capillary or filiform. 7. *Bulbostylis*

10. Leaf blades 1–2.5 mm wide, not capillary or filiform. 14. *Psilocarya*

5. Style base, if enlarged, not persisting on the achene as a tubercle.

11. Scales of the spikelet distichous, i.e., 2 ranked.

12. Achene warty on the surface. 5. *Abildgaardia*

12. Achene surface not warty.

13. Perianth bristles 6–9 subtending the achene. 3. *Dulichium*

13. Perianth bristles none. 4. *Cyperus*

11. Scales of the spikelet spirally imbricate, or with only 1–2 scales.

14. Flowers 1–2 in each spikelet.

15. Plant a very diffuse, filiform-stemmed and -leaved submersed or floating aquatic. 9. *Websteria*

15. Plant not as described above.

16. Stems to 3 m tall; leaf blades elongate, 6–10 dm, with very sharply saw-toothed margins; spikelets in clusters on an elongate inflorescence. 16. *Cladium*

16. Stems not exceeding 3 dm tall; leaf blades 3–10 cm long, with smooth margins; spikelets in a terminal involucrate headlike cluster. 17. *Remirea*

14. Spikelets several–many-flowered.

17. Scale of the spikelet with 1 or 2 bractlets above it and subtending the achene.

18. Bractlets within the scale one. 2. *Hemicarpha*

18. Bractlets within the scale two. 1. *Lipocarpha*

17. Scales of the spikelet without bractlets within it.

19. Perianth bristles absent. 6. *Fimbristylis*

19. Perianth bristles present. 11. *Scirpus*

1. Lipocarpha

Lipocarpha maculata (Michx.) Torr. Fig. 134

Densely tufted, glabrous annual. Stem triangular in cross-section, ribbed, 0.7–3 dm tall. Leaves basal, involute, very narrow, shorter than the stem. Inflorescence of several, sessile, densely flowered spikelets subtended by 2 long (3–8 cm) involucral bracts and several much shorter ones. Spikelets sessile, ovoid, pale straw-colored or nearly white. Scales of spikelet about 1.5 mm long, slenderly oblanceolate, pale with a few small brown streaks and usually a green midrib, tips spreading-ascending; outer scale subtending two slightly smaller scales which enclose the flower and achene; achene pale, 1 mm long, very slender, slightly swollen or with a short stipe at base, minutely apiculate. (*Cyperus submaculata* Koyama)

Commonly on wet alluvial sands; also shores of ponds and streams, open boggy or springy areas, borders of swamps. Coastal plain, Va. to Fla. and Ala.

Lipocarpha microcephala Kunth, an Australian plant, is known to be naturalized near Immokalee, Fla. See Long and Lakela (1971).

2. Hemicarpha

Hemicarpha micrantha (Vahl) Britt. Fig. 135

Low, tufted, glabrous annual. Stem 2–10 cm long, slightly compressed. Leaves reduced to sheaths at base of stem with an oblique orifice and a very short blade. Inflorescence subtended by 1 to 3 bracts, the longest appearing as an extension of the stem and the inflorescence seemingly lateral, of 1 to few ovoid, chestnut-colored, sessile spikelets about 3 mm long. Scales falling as achene matures exposing the rachilla and achenes. Outer scale about 1 mm long, obovate, apiculate, boat-shaped, enclosing a minute, linear, adaxial scale and the achene. Achene chestnut-colored with a bluish bloom, oblong-obovoid, minutely apiculate, about 1 mm long, surface minutely pebbled in longitudinal lines.

Moist to wet soil, commonly on alluvial sands, pond margins, streams, ditches. Maine to Ont. and Minn., generally southward to Fla. and s.e. Tex.; trop. Am.

Hemicarpha aristulata (Cov.) Smythe, of the Midwestern and Pacific states, was collected once in Martin Co., Fla., where it was locally abundant in wet sandy-peaty soil on a broad highway right of way. In general habital features it is closely similar to *H. micrantha.* It differs in that the floral scale is contracted to a long awn as long as or longer than the body of the scale and much exceeding the achene, the latter more definitely obovoid, the apex truncate and with a minute apiculation, the surface minutely alveolate (fig. 135).

3. Dulichium

1. Dulichium arundinaceum (L.) Britt. THREE-WAY SEDGE. Fig. 136

Perennial, forming extensive clones, with hollow, terete, septate-jointed stems arising from a horizontal rhizome and with an elongate conspicuously leafy inflorescence. Flowering stems to 10 dm tall. Leaves numerous, the lower reduced to brown sheaths, the upper conspicuously 3-ranked, the blades flat, linear, 2–10 cm long, 4–8 mm wide, spreading to ascending. Laterals of the inflorescence stalked, the spikelets several on each axis and borne in 2 ranks, linear, spreading, 1.0–2.5 cm long, 4–12-flowered. Scales lanceolate, keeled, acuminate, strongly nerved, margins hyaline, the lowermost scale of each spikelet sterile. Flowers bisexual. Bristles 6, downwardly barbed, nearly twice as long as the achene. Stamens 3, anthers about 3–4 mm long. Style 2-cleft above. Body of the achene lenticular, smooth, about 3–4 mm long, beaked with long persistent style, lower portion of achene narrowed greatly.

Edges of streams, lakes, swamps, bogs, often in standing water. Temp. N.Am.

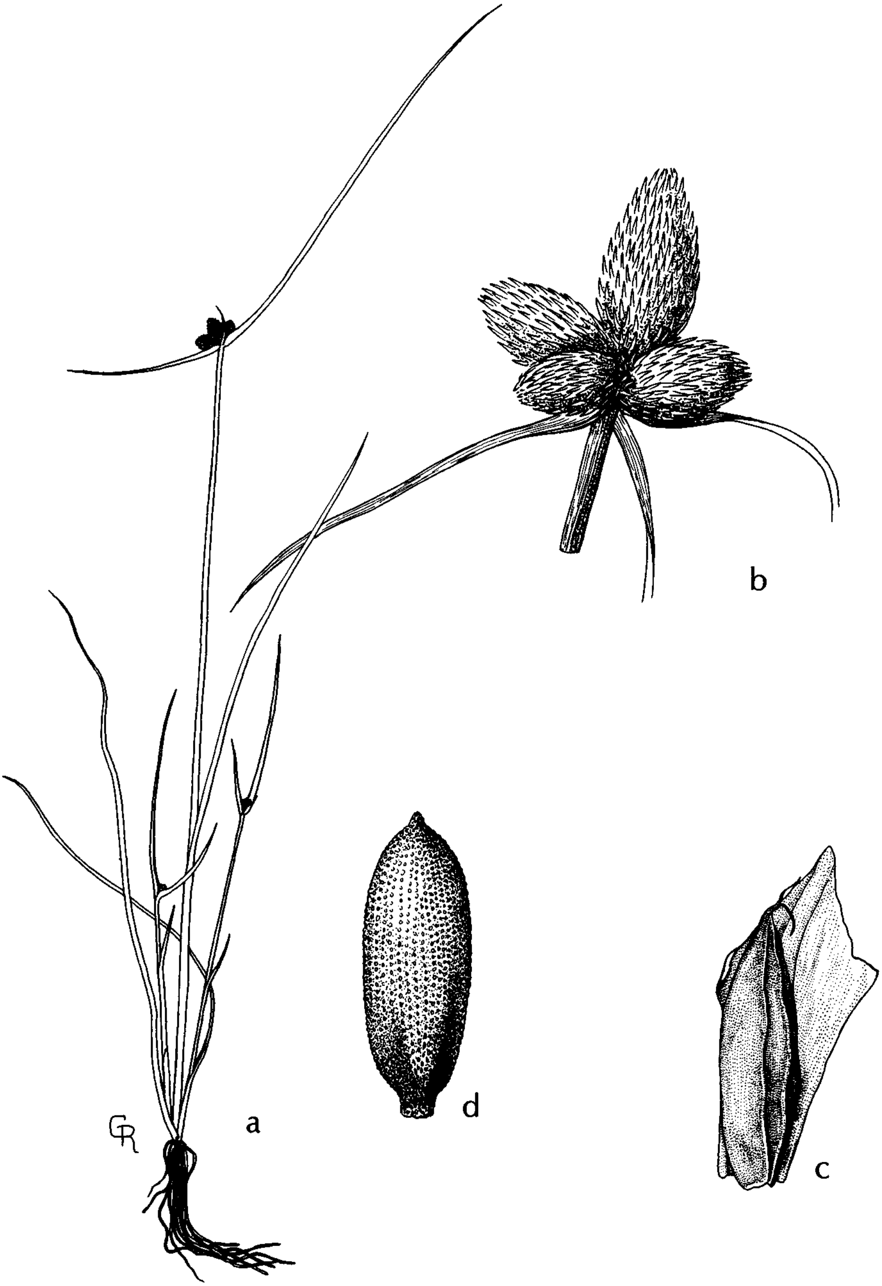

Fig. 134. **Lipocarpha maculata:** a, habit; b, inflorescence; c, scale and bractlets surrounding flower; d, achene.

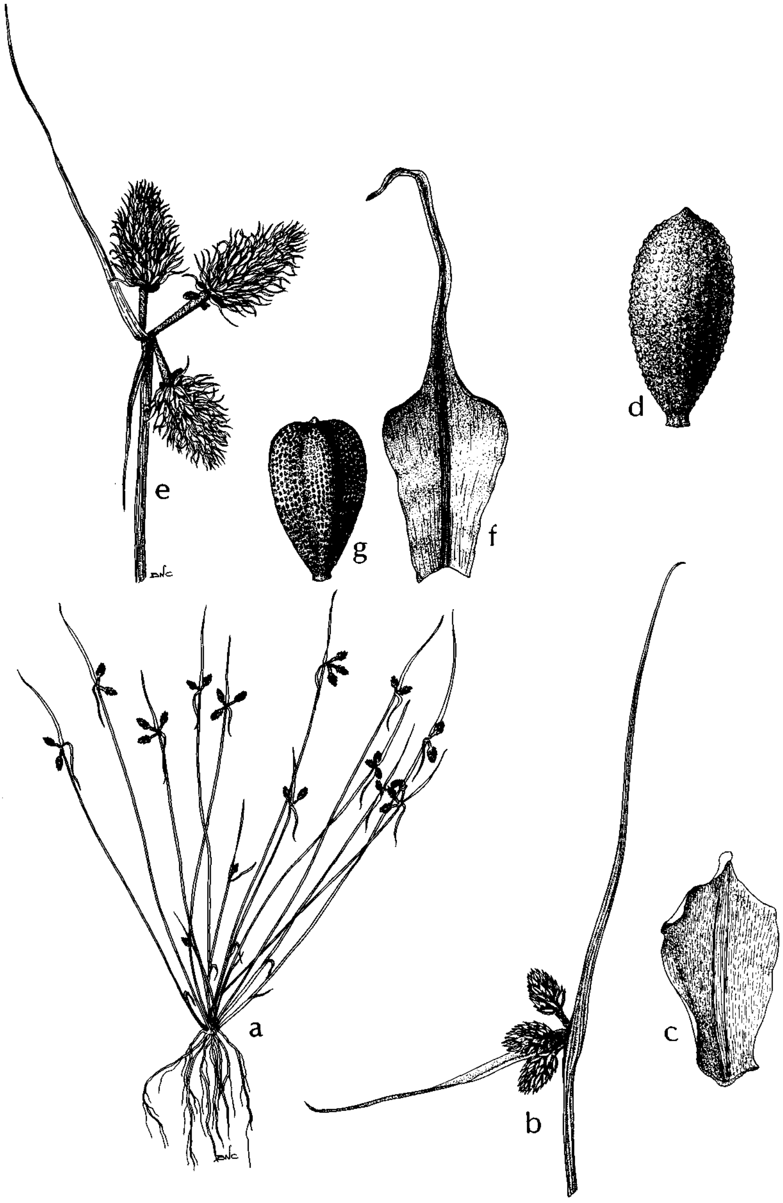

Fig. 135. a–d, **Hemicarpha micrantha:** a, habit; b, inflorescence; c, scale; d, achene; e–g, **Hemicarpha aristulata:** e, inflorescence; f, scale; g, achene.

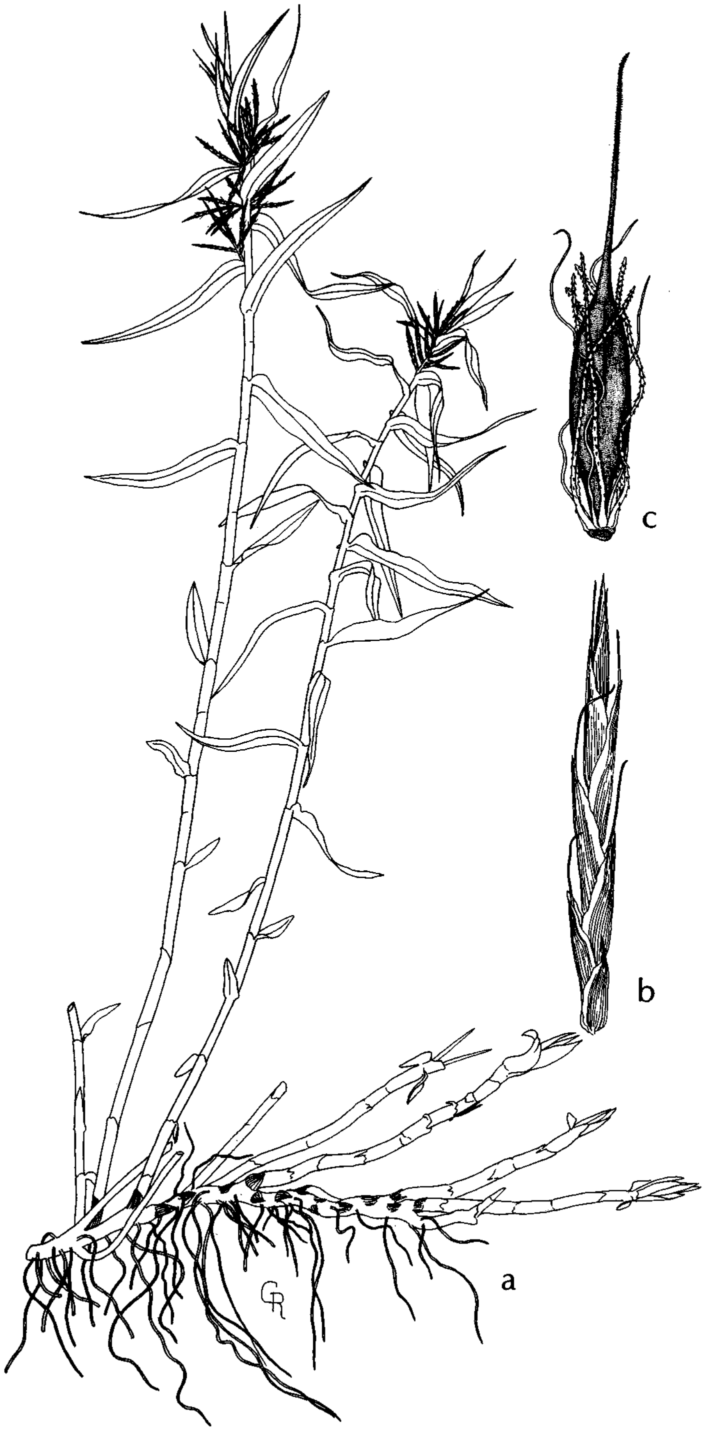

Fig. 136. **Dulichium arundinaceum:** a, habit; b, spikelet; c, achene.

4. Cyperus (FLAT SEDGE, GALINGALE, SWEET-RUSH)

Herbs of grasslike aspect, annual or perennial. Flowering stems (in our species) leafy only near the base, thus nearly scapose, in most species with well-developed blades, in a few with bladeless sheaths only. Overall inflorescence terminating the scape, subtended by foliar (involucral) bracts. Basic inflorescence unit a spikelet, its axis jointed, with a minute bract basally, usually bearing several–numerous scales in two ranks, each subtending a floret, the floret without a perianth; in a few species spikelet with a single fertile floret and one or more empty scales. Spikelets on the ultimate inflorescence branches in headlike clusters, glomerules, spikes, or rarely panicles, the ultimate spikelet bearing axes usually in simple or compound umbels, the stalks of the umbel usually unequal. Spikelets falling entire, or shedding scales and achenes individually from the base upward, or disarticulating at the joints of the spikelet axis. Florets with 1–3 stamens; styles 2–3 cleft or branched, achenes lenticular or trigonous.

A very large genus, species particularly numerous in warmer regions of the world. Mature spikelets and achenes essential for identification, and it is important to know whether plants are rhizomatous or tufted, whether annual or perennial.

1. Styles 2-cleft; achene lenticular.
  2. Spikelets producing 1 or 2 achenes.
    3. Plant a rhizomatous mat-forming perennial. 1. *C. brevifolius*
    3. Plant tufted.
      4. Mature achene yellow to brown. 2. *C. tenuifolius*
      4. Achene black, with a brownish calluslike disk below, the apiculus brownish. 3. *C. sesquiflorus*
  2. Spikelets producing 3–numerous achenes.
    5. Scale with a whitish-hyaline margin.
      6. Plant diminutive, seldom if ever exceeding 1.5 dm tall, usually shorter; scale hyaline from the green median outward; mature achene filling about half the scale. 4. *C. pumilus*
      6. Plant not diminutive, 2–8 dm tall, seldom less than 3 dm; scale chestnut brown outward from the green median and with a whitish-hyaline margin at least on the distal half; mature achene filling the scale. 5. *C. albomarginatus*
    5. Scale margin not whitish-hyaline.
      7. Surface of achene with longitudinally elongate cells, usually transverely lined, black at maturity. 6. *C. flavescens*
      7. Surface of achene finely cancellate with isodiametric cells, not transverely lined; not black at maturity.
        8. Achene linear-oblong to very narrowly oblong-obovate, if the latter the summit only slightly broadened, 3 times as long as broad or a little more; mature achene grayish-iridescent (brown prior to maturation). 7. *C. polystachyos*
        8. Achene oblong to oblong-obovate, its broadest portion not over ½ as broad as long; mature achene olivaceous, orange, orange brown or brown, not iridescent.
          9. Scales straw-colored, without reddish pigment. 8. *C. lanceolatus*
          9. Scales with reddish pigment.
            10. Reddish pigment on the side of the scale outward from the midrib to the margin, sometimes only across the base of the scale, or in a broad band from base to apex. 9. *C. bipartitus*
            10. Reddish pigment on the side of the scale chiefly as a narrow marginal band below, flaring distally, often entirely across the tip of the scale. 10. *C. diandrus*
1. Style 3-cleft; achene 3-angled.
  11. Leaves consisting of essentially bladeless sheaths.
    12. Foliar bracts subtending inflorescence 10–25, mostly conspicuously longer than the inflorescence. 11. *C. alternifolius*
    12. Foliar bracts subtending inflorescence 3 or less, inconspicuous, not or very little exceeding the inflorescence.
      13. Coarse rhizomatous perennial, the stems nearly terete and with cross-septae, 10–20 dm tall. 12. *C. articulatus*
      13. Tufted perennial, the stems sharply angled, slender, soft and weak, mostly 2–7 dm tall. 13. *C. haspan*
  11. Leaves, at least some of them, definitely with blades.

14. Spikelet at maturity breaking into joints each comprised of a scale and the short, next lower internode of the spikelet axis which clasps the base of the achene. 14. *C. odoratus*

14. Spikelet shedding scales and achenes individually, leaving the spikelet axis intact for a time, or spikelet shedding as a whole at maturity.

15. Plants diminutive annuals; scales of the spikelets with outcurving, elongate greenish mucros giving the spikelet clusters a bristly appearance.

16. Scales gradually narrowed into the mucro; sides of the scale with several nerves well distributed between the midrib and margin. 15. *C. aristatus*

16. Scales with the green median extended as a mucro beyond the broad summits of the sides of the scale; sides of the scale with a single nerve close to and paralleling the midrib. 16. *C. cuspidatus*

15. Plants not diminutive annuals or if diminutive the spikelet scales not as described.

17. Spikelets numerous in ovoid, ellipsoid, cylindrical, or globose headlike spikes (these sometimes branched-lobulate), the spikelet-bearing axis hidden.

18. Heads of spikelets globose or globose-ellipsoid, the spikelets radiating outward in all directions so that their pointed tips are relatively remote from each other. 17. *C. globulosus*

18. Heads of spikelets mostly cylindric or branched-lobulate, the lobes cylindric, if globose then the uppermost spikelets erect, the middle ones diverging about at right angles, the basal ones reflexed.

19. Plant green, not glaucous, relatively slender, bases of the stem less than 1 cm broad; leaf blades flexuous, finely scabrid on the margins, sometimes scabrid only distally; spikelets green to straw-colored. 18. *C. retrorsus*

19. Plants glaucous, coarse, bases of the stem, including the very broad sheaths, 1.5–2.0 cm broad or broader; leaf blades very stiff, sharply scabrid on the margins; spikelets rich reddish brown to brown and with a grayish cast. 19. *C. ligularis*

17. Spikelets few to several to many, disposed in such a way that the spikelet-bearing axis is visible; in essentially paniculiform clusters on the ultimate branches, or on short to longish axis and borne more or less pinnately from it, or in sessile capitate clusters, 2–many spikelets in the cluster.

20. Principal branches of the inflorescence with the spikelets arranged essentially in very loose and open panicle; florets loosely disposed on the spikelet axis, about 1.5 mm long and to the naked eye appearing tiny-beadlike. 20. *C. iria*

20. Principal branches of the inflorescence with the spikelets disposed other than in loose and open panicles.

21. Spikelet bearing axis more or less elongated, the spikelets several to many and mostly radiating horizontally from the axis, the lowermost sometimes deflexed, the uppermost ascending.

22. Plant rhizomatous.

23. Spikelets reddish purple. 21. *C. rotundus*

23. Spikelets straw-colored to brown or golden brown (rarely with a reddish cast but not purplish). 22. *C. esculentus*

22. Plant tufted.

24. Plant glaucous; spikelets light reddish brown to dark reddish brown. 23. *C. planifolius*

24. Plant not glaucous; spikelets straw-colored, tawny, brown or golden.

25. Spikelets falling entire at maturity; scale outward from the green median with 2 or more nerves; achene about 2 mm long, linear-oblong, often curved, apiculate at the summit. 24. *C. strigosus*

25. Spikelet shedding scales and achenes individually from the base distally as maturation occurs, the spikelet-bearing axis remaining intact for a time; scale outward from the median nerveless; achene 1 mm long, short-oblong, broadly elliptic, or slightly ovate, broadly obtuse at the summit. 25. *C. erythrorhizos*

21. Spikelet bearing axis short, the spikelets closely clustered or capitate clustered, not horizontally radiating from a longish axis.

26. Spikelet clusters comprised of many spikelets closely aggregated into a roundish or roundish-lobed mass; florets tiny-beadlike to the naked eye, rather loose on the spikelet axis; scales about 1 mm long. 26. *C. difformis*

26. Spikelet clusters not as above; scales exceeding 1 mm long.

27. Plant with slender reddish purple rhizomes. 27. *C. lecontei*

27. Plant tufted, not rhizomatous.

28. Median or midrib area of the mature fertile scales (at least the basal or proximal portion of the scale) troughed or flat, usually the former. (To be observed best, scale must be oriented with the full back to the viewer.)

29. Flowering stem (scape) scabrid at least distally, i.e., below the inflorescence, sometimes the teeth deciduous but then their positions marked by little bumps, spots, or irregularities.

30. Scabrosity on the scape retrorse, i.e., pointed downward, and sparsely scattered over the surface, not on the angles alone. 28. *C. surinamensis*

30. Scabrosity on the scape antrorse and confined to the edges of the angles.

31. Base of the spikelet 2.5–3.0 mm wide; scales thrice as long as broad or a little more, long-acute or acuminate apically, twice the length of the enclosed achene and securely enveloping it so that the achene and scale are not easily separated. 29. *C. virens*

31. Base of the spikelet 2 mm wide; scales twice as long as broad, short-acuminate apically, achene filling the scale about to the base of the acuminate tip, the mature achene held loosely by the scale and easy to remove. 30. *C. robustus*

29. Flowering stem (scape) very smooth, without scabrosity and without blemishes left by deciduous teeth.

32. Achene subtended at the base by a whitish spongy callosity, this usually with a diameter as great as that of the achene body. 31. *C. distinctus*

32. Achene not subtended at base with a whitish spongy callosity (that of *C. pseudovegetus* may have a tiny darkened knoblike stipitate base, but this with a diameter not nearly that of the achene body).

33. Achene linear-elliptic in outline, usually curved or falcate, narrowed below to a short stipitate base, this darkened and tiny-knoblike at its lower extremity. 32. *C. pseudovegetus*

33. Achene elliptic to ovate in outline, sometimes asymmetric but not falcate.

34. Scales strongly acuminate apically and their tips turned outward markedly giving the edge of the spikelet a definitely serrated appearance. 33. *C. acuminatus*

34. Scales short-acuminate apically, the tips ascending and the spikelet with a smoothish edge. 34. *C. ochraceus*

28. Median or midrib area of the mature fertile scales keeled or rounded-convex.

35. Perennial, sticky-viscid when fresh; sheaths with short cross-septae within, longitudinal rectangular chambers between the septae; margins of the spikelets appearing markedly serrated, the serrations hard.

36. Scale in side view oblique-ovate; achene black with a thin cellular overlay which is grayish and somewhat iridescent and sloughs, obovate in outline. 35. *C. elegans*

36. Scale in side view oblique-lanceolate, weakly **S**-shaped; achene dull amber, oblanceolate in outline. 36. *C. oxylepis*

35. Annual, not sticky-viscid; sheaths not septate-chambered; margins of spikelets serrated but the scale tips soft. 37. *C. compressus*

1. Cyperus brevifolius (Rottb.) Endl. ex Hassk. Fig. 137

Perennial, with slender reddish brown or reddish purple rhizomes, mat-forming. Flowering stems slender, soft, 6–40 cm tall, commonly 10 cm or less. Lower leaf sheaths usually bladeless, purplish, others with blades 1–3 mm wide and very variable in length, 1–10 cm or more, shorter than to exceeding the flowering stems. Inflorescence a congested head, usually ovate, ovate-oblong, or spherical, 3.5–7 mm long. Foliar bracts subtending the inflorescence 3 (–4), somewhat unequal, all much surpassing the inflorescence. Spikelets shed at maturity as a unit, 2–3 mm long, with two scales, the lower empty, the upper enclosing a floret; scales strongly keeled, the keel green, winglike, partially toothed, the sides tan or buff, 2–5-nerved, translucent between the nerves, acuminate apically; achene lenticular, 1.0–1.3 mm long, oblong to obovate, with a short round stipelike base, the apex nearly truncate but abruptly apiculate, yellow, golden brown to brown. (*Kyllingia brevifolia* Rottb.)

Commonly weedy in moist to wet places, lawns, gardens, fallow or cultivated fields;

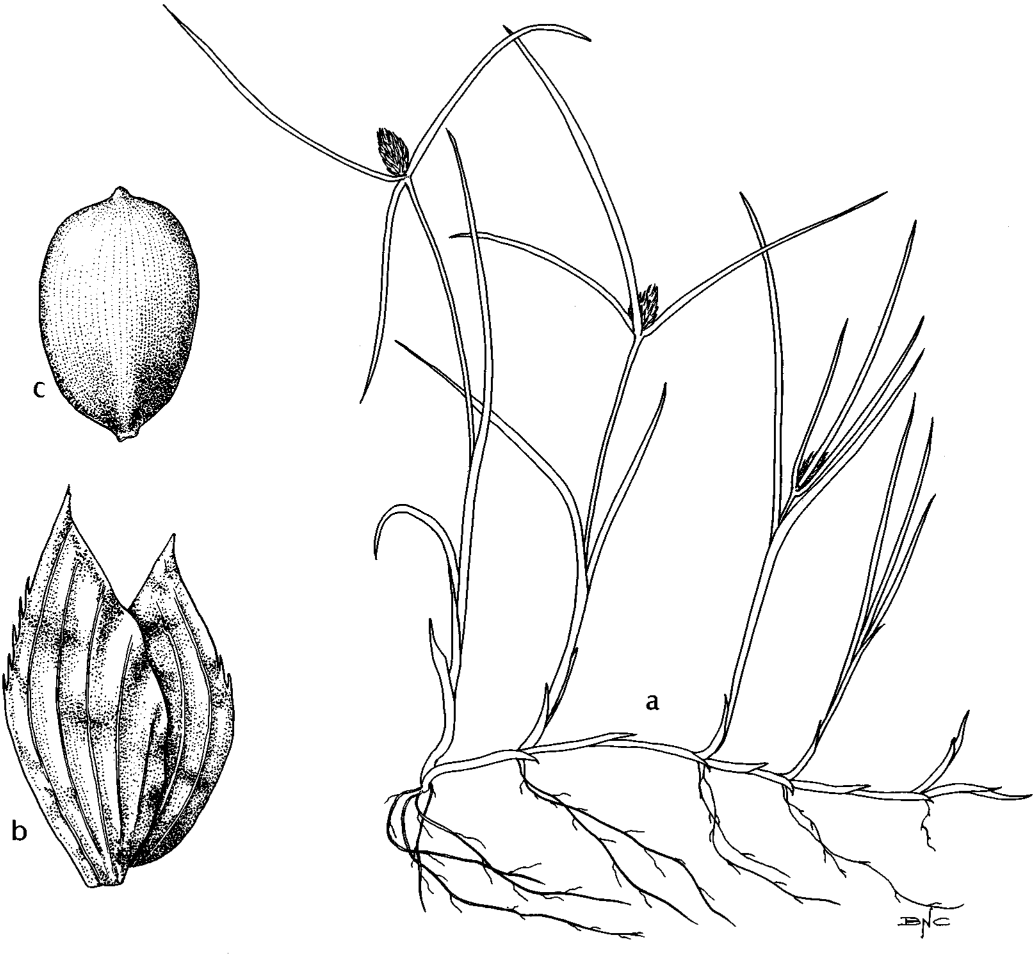

Fig. 137. **Cyperus brevifolius:** a, habit; b, scales; c, achene.

also marshy shores, moist to wet clearings, sand bars, margins of swamps, pastures. E. N.C. to s. Fla., w. to Tex., s.e. Okla.; Calif; tropics and subtropics generally.

Note: Apparently of sporadic occurrence from Conn. to w. N.C. is a very similar rhizomatous plant, *C. brevifolioides* Thieret & Delahoussaye. Its spikelet is 3.5 mm long or more (average 6 mm), its achene 1.5–1.8 mm long, the keel of the scale not toothed. This species occurs in e. Asia principally. (See Thieret & Delahoussaye in *SIDA* 3: 128–136. 1967.)

2. **Cyperus tenuifolius** (Steud.) Dandy in Exell. Fig. 138

A densely tufted aromatic annual. (This and *C. sesquiflorus*, excepting that they are non-rhizomatous, very much resemble *C. brevifolius* in general aspect.) The compacted inflorescence usually, not always, 3-lobed, the central lobe usually somewhat longer than the basal laterals. Spikelets with two scales, the upper empty, the lower enclosing a floret; keel of the lower scale with a few teeth (these not always easily discernible), scale in side view lanceolate-acuminate, 2–4-nerved, the nerves not usually equally evident; achene lenticular, oblong or oblong-obovate, narrowed below to a short stipelike base, apically nearly truncate, short-apiculate, about 1 mm long excluding stipe and apicule, yellow to brown. Mature achene very tightly enclosed by the scale. (*C. densicaespitosus* Mattf. & Kükenth.; *Kyllingia pumila* Michx.)

Swamps, marshy shores of streams, ponds, wet clearings, bogs, alluvial outwash, sand and gravel bars, ditches. E. Pa. to Mo., e. Kans., generally southward to s. Fla. and Tex.; Mex. to Argen., W.I., trop. Afr.

3. **Cyperus sesquiflorus** (Torr.) Mattf. & Kükenth. in Engl. Fig. 138

Similar to *C. tenuifolius*. Compact heads of spikelets cylindrical or 3-lobed, the central lobe cylindrical, to about 15 mm long, the mass with a whitish cast when fresh. Plant with a rather rank odor. Spikelet with two scales, the lower enclosing a floret (or both enclosing a floret sometimes?); keel of the scale not or only minutely toothed; achene lenticular, oblong-obovate, often asymmetric, 1.2–1.5 mm long, black, basally with a brownish calluslike disk, apically truncate or nearly so but with a brownish apiculus. (*Kyllingia odorata* Vahl)

Marshy shores of streams, ponds, lakes, wet clearings, moist lawns, fields, ditches. E. N.C. to s. Fla., w. to Tex., s.e. Ark.; Mex. to Uru.; W.I.

4. **Cyperus pumilus** L. Fig. 139

A diminutive annual, tufted, often becoming cushionlike. Flowering stems 3–15 cm tall, mostly about 5–6 cm. Lowest leaves bladeless sheaths, often reddish, broadly obtuse apically; blades of other leaves 0.5–2.0 mm wide, the longer equalling or surpassing the inflorescence. Foliar bracts subtending the inflorescence setaceous, conspicuous, usually 3, unequal, all exceeding the inflorescence but one usually markedly so. Inflorescence sometimes a single compact, nearly globular glomerule, sometimes with 2–3 short-stalked ones as well. Spikelets linear-oblong, 0.5–1 cm long, 2 mm wide, the florets ascending, loosely overlapping, most maturing before any are shed; in side view scales 1.5 mm long or slightly more, oblong, short-acuminate apically, moderately keeled, the midrib green, extending a bit beyond the hyaline nearly straw-colored sides as a soft mucro, one yellowish nerve close to and paralleling the midrib; achene lenticular, oblong, or oblong-obovate in outline, apically truncate but apiculate, at full maturity gray iridescent, brown just before maturity, a little over 0.5 mm long, filling less than half the scale.

In wet sands and peaty-sands, exposed shores, clearings, alluvial outwash. Cen. and s. Fla. and one station known to us in Franklin Co., in the Fla. Panhandle. Native in the Old World, naturalized here.

5. **Cyperus albomarginatus** Mart. & Schrad. ex Nees. Fig. 140

Tufted annual. Flowering stems 2–8 dm tall. Leaf sheaths relatively broad, loose and open at least distally, the blades 1–5 mm wide, equalling or exceeding the inflorescence.

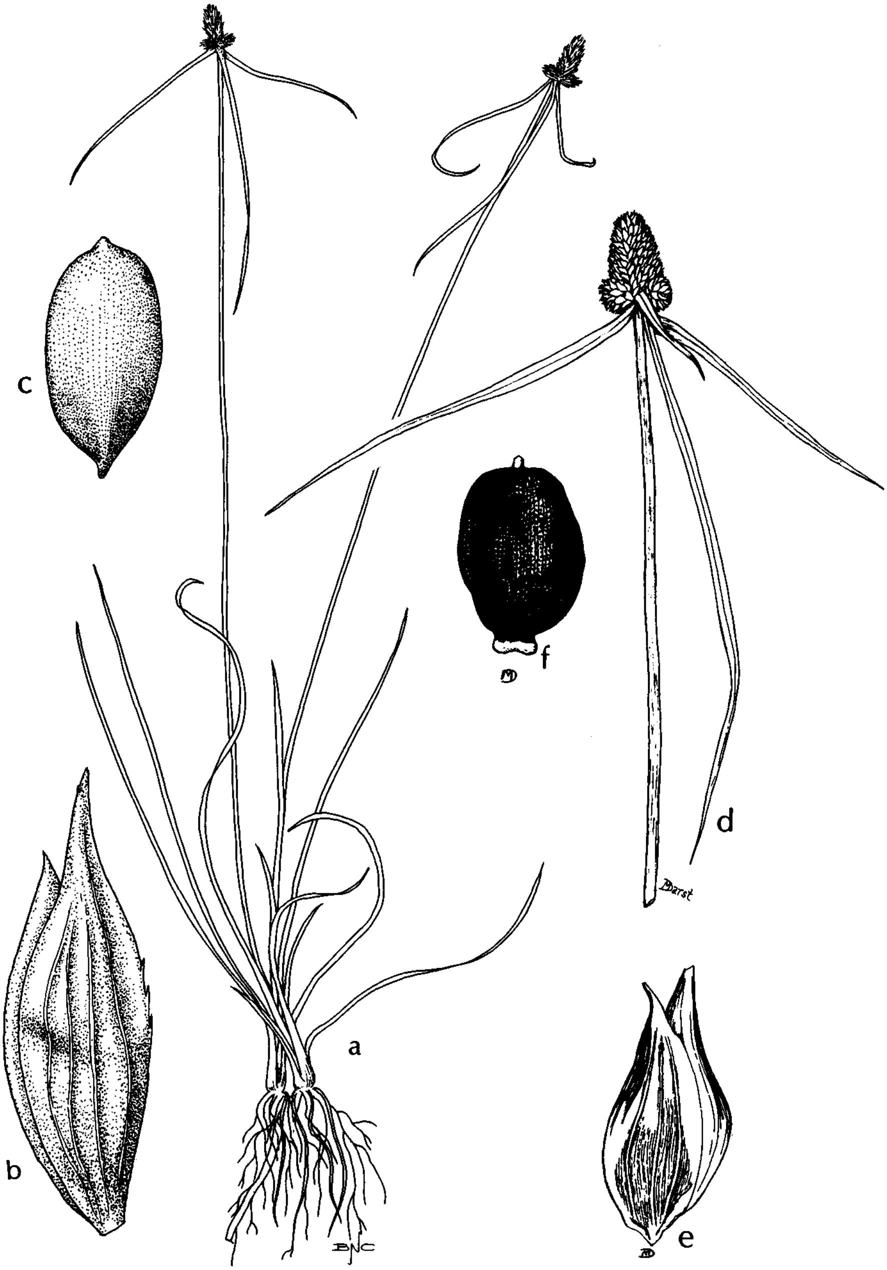

Fig. 138. a–c, **Cyperus tenuifolius:** a, habit; b, scales; c, achene; d–f, **Cyperus sesquiflorus:** d, inflorescence; e, scales; f, achene.

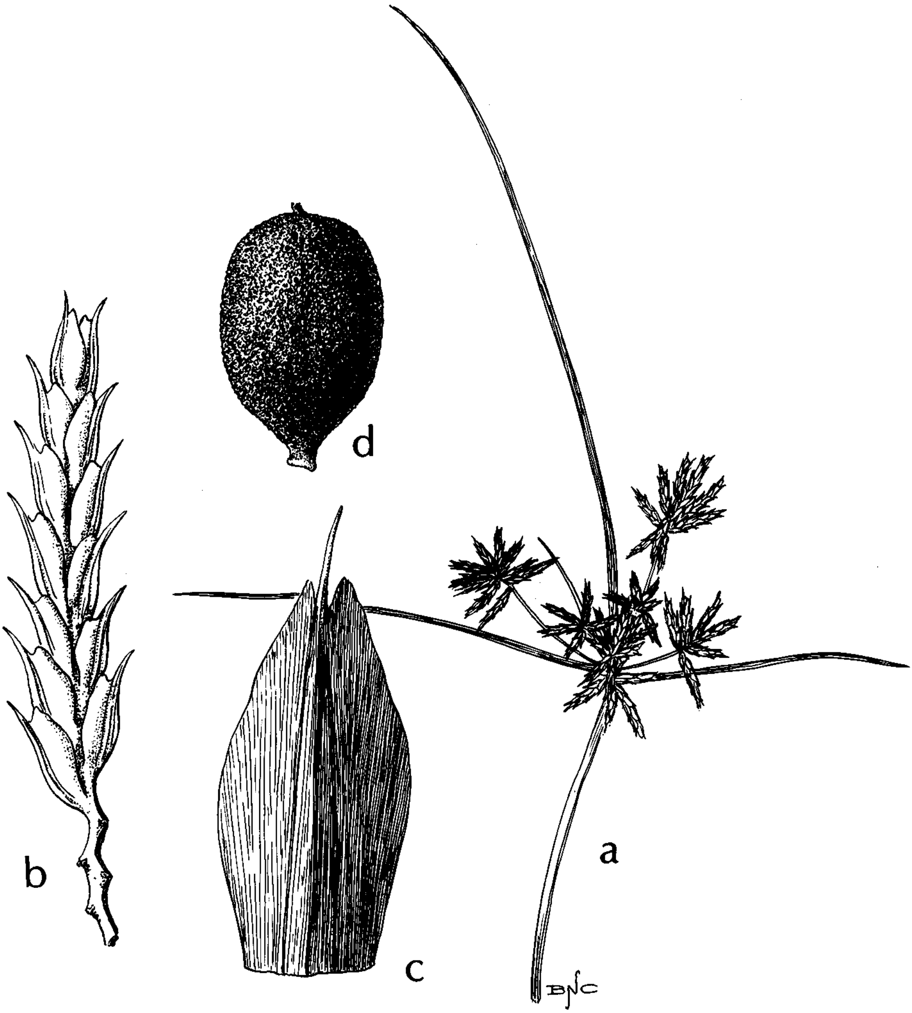

Fig. 139. **Cyperus pumilus:** a, inflorescence; b, spikelet; c, scale; d, achene.

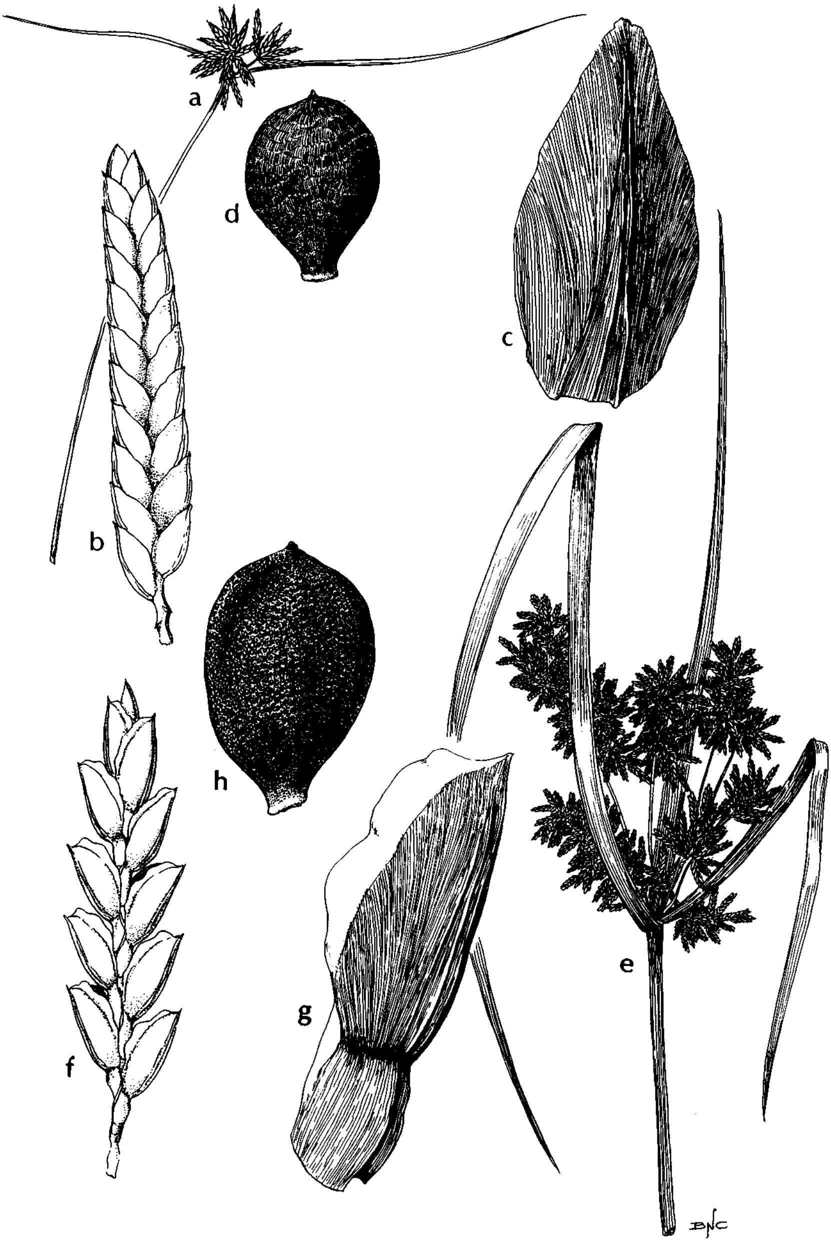

Fig. 140. a–d, **Cyperus flavescens:** a, an inflorescence branch; b, spikelet; c, achene; e–h, **Cyperus albomarginatus:** e, inflorescence; f, spikelet; g, scale; h, achene.

Foliar bracts subtending the inflorescence 3–7, conspicuous, some or all very much surpassing the inflorescence and as wide as or wider than the leaf blades. Inflorescence of some sessile and some unequally stalked spikes or panicles, the spikelets disposed rather loosely, and the florets not much overlapping, rather short and to the naked eye giving a small-beaded appearance somewhat reminiscent of that of *C. iria*; axes of the inflorescence grayish, usually with longitudinal reddish flecks or stripes. Spikelets 5–12 mm long, the florets ascending, somewhat overlapping, tending to spread laterally as they mature thus giving the spikelet margin rather a serrated character. Scales 1.0–1.5 mm long or a little longer, folded but roundish on the back, in side view more or less obovate in outline, the greenish central-nerved portion just visible (from the side), lateral to it a strong whitish nerve nearly its full length, sometimes a second short nerve on the basal portion; side of the scale, lateral to the whitish nerve, more or less chestnut brown and with a conspicuous broadish white hyaline border, this sometimes the full length of the scale, sometimes only on about the distal half; apex of the scale (including all the hyaline margin there) broadly rounded to virtually truncate; achene lenticular, about 0.9 mm long, obovate, narrowed to a short, thickish stipelike base flaring somewhat at its lower extremity, the achene body asymmetric basally, rounded apically and apiculate, maturing to a very dark purplish black, the surface very finely cancellate; achene loosely clasped by the scale at maturity.

Local, sporadic, ditches, low fallow fields, washes along streams, alluvial silts. E. Va. to Ala., Tenn., La., Tex., Ariz.; pantropical.

6. Cyperus flavescens L. Fig. 140

Tufted annual. Flowering stems 1–2.5 dm tall, soft and weak. Sheaths usually reddish purple, blades 0.5–2 mm wide, the longer reaching the inflorescence. Inflorescence a single tight glomerule of spikelets, or in addition with 2–several unequally stalked glomerules. Spikelets flat, linear-oblong, mostly 0.5–1.5 cm long, the scales closely imbricate, the edges of the spikelet essentially smooth to the naked eye; lower scales and achenes maturing and sometimes shedding as distal ones develop. Scales 2 mm long, in side view triangular-ovate, the median green, the sides yellowish or straw-colored, sometimes suffused with a bit of reddish brown pigment, somewhat translucent, not nerved, apically bluntish; achenes lenticular, obovate to nearly orbicular-obovate, broadest portion sometimes very nearly equalling the length (excluding substipitate base and apicule at the summit), about 1 mm long; during maturation surface features changing: at an early stage surface with a crusty brownish, shellacked appearance; later the surface with a thin translucent covering with vertically elongated cells; still later the translucent covering partly sloughs, partly shrinks, leaving irregular, thin, horizontal, gray lines, the somewhat shiny black, hard achenial surface showing between; finally all the translucent material may slough leaving a hard, black surface, this sometimes virtually smooth, sometimes conspicuously reticulate with elongate, vertically oriented alveolae.

Marshy shores of streams, ponds, lakes, mucky ditches, wet peaty sands of depressions in pine savannas and flatwoods, wet clearings, alluvial outwash. Mass. to Mich., Mo., Kans., generally southward to s. Fla. and Tex.; tropics.

7. Cyperus polystachyos Rottb. Fig. 141

Tufted perennial (flowering the first year from seed), the plants often close-set and matted. Variable in stature, to 3.5 dm tall or a little more; autumnal plants flowering the first year from seed, often diminutive, consisting mainly of inflorescences, 1–several cm tall, sometimes cushionlike. Leaf blades narrow, 0.5–2 mm wide, commonly, but not always, surpassing the inflorescence. Inflorescence very variable, with all sessile spikes in a single compact glomerule, with short-stalked spikes in a single compact glomerule, varying to a condition such that there are sessile spikes and stalks of very unequal length, some secondarily branched, bearing spikes terminally. Spikelets sometimes diverging from the axis at right angles or nearly so, the lower ones reflexed, sometimes

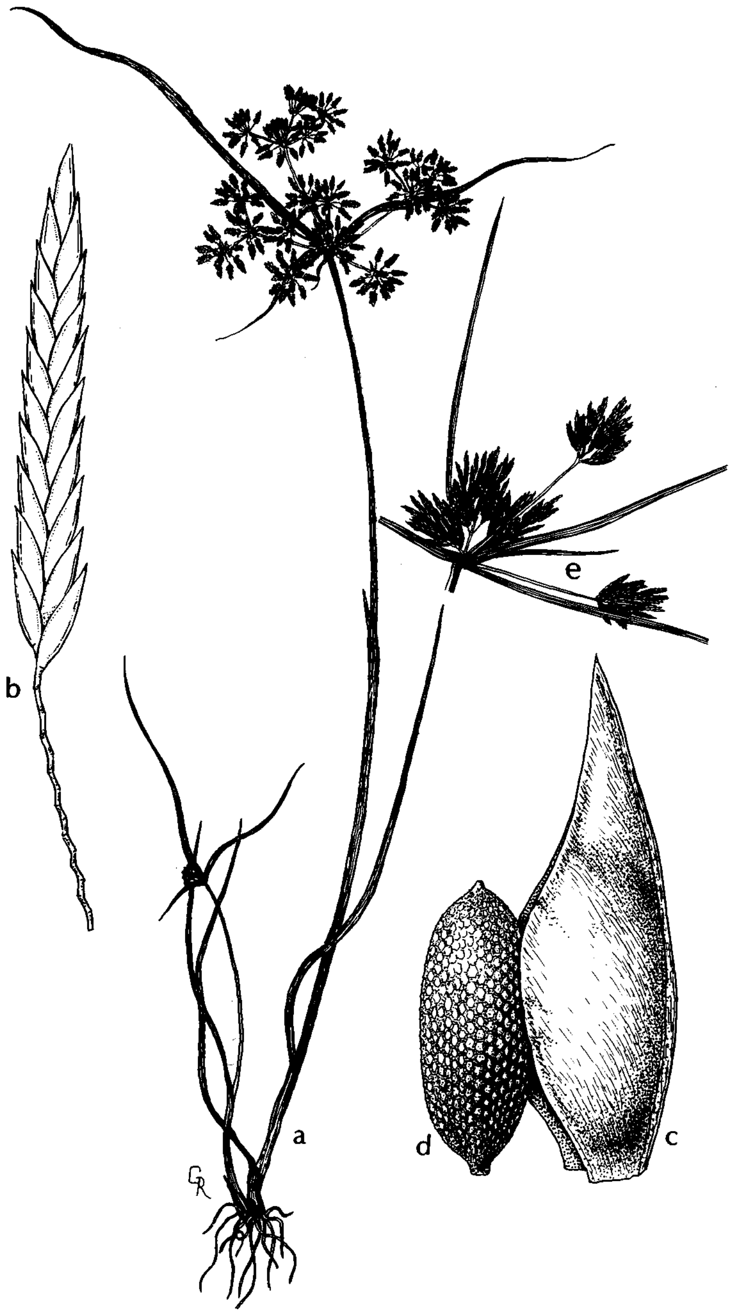

Fig. 141. **Cyperus polystachyos:** a, habit; b, spikelet; c, scale; d, achene; e, inflorescence of form with spikelets strongly ascending in the glomerules.

all or nearly all strongly ascending; spikelets linear-acute, 1–2 cm long, with many appressed-ascending and overlapping florets, the lower maturing and shedding scales and achenes as the upper develop; scales keeled, 1.5–2.5 mm long or a little more, in side view oblongish below then tapering to an acute apex, a nerve close to and on either side of the green median, the sides yellowish to reddish brown, scarious marginally; achene lenticular, oblong, linear-oblong to narrowly oblong-obovate, if the latter the summit only slightly broadened, 1 mm long or a little more, maturing through brown to grayish iridescent, with a very finely cancellate surface layer of cells which may in sloughing give a gray, crusty appearance. (*C. careyi* Britt. ex Small; *C. microdontus* Rottb.; *C. odoratus* sensu Small, not L.; *C. paniculatus* Rottb.; *C. polystachyos* var. *texensis* (Torr.) Fern.)

In wet or seasonally wet places, marshes, marshy shores, sandy to sandy-peaty shores exposed at times of low water, wet clearings, ditches, spoil banks or flats, depressions in pinelands. Mass. to s. Fla., w. to Tex., n. in the interior to Mo.; pantropical.

A polymorphic species; according to some authors, only what may be distinguished as the var. *texensis* occurs in our range. There is also equivocation by authors as to whether *C. filicinus* Vahl. is distinguishable as an entity from *C. polystachyos* in our range; if so it is perhaps best treated as *C. polystachyos* var. *filicinus* (Vahl) O'Neill.

8. Cyperus lanceolatus Poir. in Lam.

Habit, spikelets and scales indistinguishable from those of *C. flavescens*. Achene oblong to oblong-obovate, sometimes asymmetrical, substipitate basally, apiculate apically, about 1 mm long excluding stipe and apicule; occasionally in early stages of maturation having a thin translucent surface covering with isodiametric cells, this apparently sloughing off early and completely; mature achene orange brown to brown, the surface longitudinally very finely lined or with longitudinal rows of tiny isodiametric cells. (*C. densus* Link)

Marshy and boggy shores, seepage slopes, mucky ditches, wet sandy alluvium, wet clearings, ditches. N. Fla. and perhaps elsewhere in our range; pantropical.

9. Cyperus bipartitus Torr. Fig. 142

Tufted annual, very similar in aspect to *C. flavescens*, differing in color of scales and surface markings and color of achenes. Perhaps more nearly like *C. diandrus* in general aspect, differing from it in pattern of pigmentation of scales, length and shape of scales, and in style branching (see *C. diandrus*). Scale, seen in side view, nearly ovate-oblong, the summit rounded or blunt-angled, at maturity pigmented reddish brown or reddish purple outward from the green midrib to the margin, or sometimes only across the base of the scale, often in a broad band from base to apex paralleling the midrib but the band not necessarily just next to it; style cleft nearly to the base; achene lenticular, about 1.0–1.5 mm long, obovate, commonly asymmetric, usually substipitate basally, apiculate apically, the surface (seen with suitable magnification) very very finely cancellate with isodiametric cells, surface dull, olivaceous to brown or dark brown. (*C. rivularis* Kunth; *C. niger* R. & P. var. *castaneus* (Pursh) Kükenth.)

Margins of streams, marshes, shores of ponds, lakes, bogs, depressions in pine savannas, low fields, sand bars, ditches. Que. to Minn., Nebr., s. to Ga., Ala., Miss., Tex., Calif., Oreg.

10. Cyperus diandrus Torr. Fig. 142

Tufted annual, in general aspect very much like *C. bipartitus*. Scales, seen in side view, lanceolate-acuminate, incurving apically, at maturity the reddish purple pigmentation chiefly as a narrow marginal band which flares distally, often entirely across the tip of the scale except for the green midrib; style cleft from about the middle; achene a little over 1 mm long, oblong to oblong-obovate, often asymmetric, not at all stipitate, apiculate apically, surface as in *C. bipartitus*.

Marshy and wet sandy shores. Que. and Maine to Minn., s. Ind., Mo., Va., cen. Tenn., n. Ala.

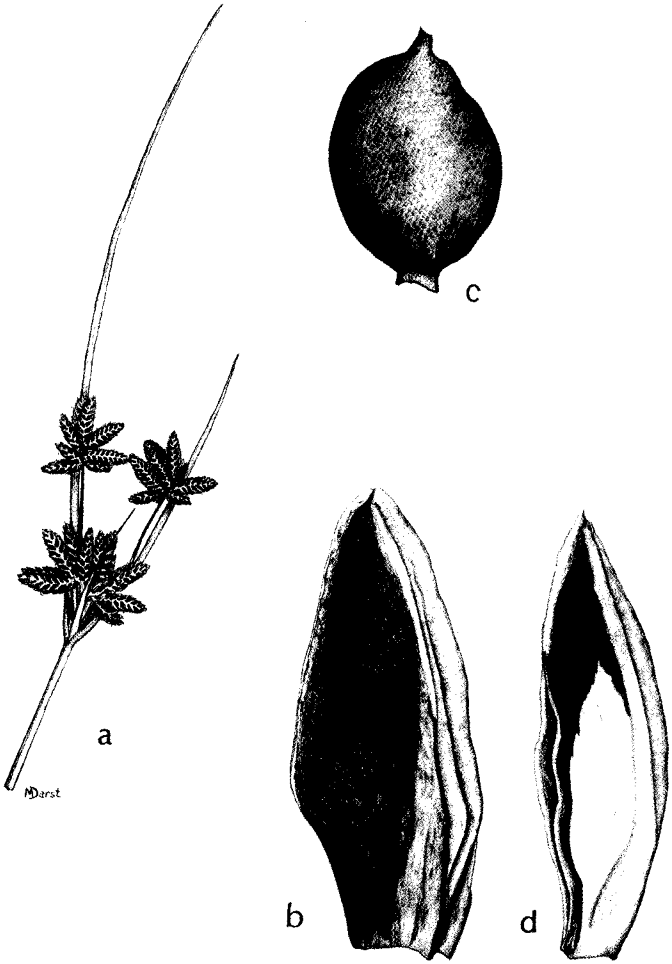
c
a
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Fig. 142. a–c, **Cyperus bipartitus:** a, inflorescence; b, scale; c, achene; d, **Cyperus diandrus:** scale.

11. Cyperus alternifolius L. UMBRELLA FLATSEDGE. Fig. 143

Perennial, forming very large clumps. Stems to 1.5 m tall, to about 2 cm thick basally, triangular. Leaves of a few basal bladeless sheaths, diagonal at the orifice and with a triangular apex. Inflorescence subtended by 10–25 conspicuous foliar bracts, most of them exceeding the inflorescence which is comprised of a central essentially sessile spikelet cluster and 15–25 primary elongate stalks each bearing terminally a short headlike raceme of 8–15 spikelets. Spikelets linear-oblong, 5–10 mm long, 1.5–2 mm wide, with 12–30 flowers. Scales nearly elongate-triangular unfolded, falling free from the axis, sometimes before the achenes. Achene 3-angled, brown, elliptic-oblong, 0.6–1.0 mm long.

Native in the Old World, commonly cultivated for ornament, occasionally naturalized in moist to wet swampy places and along shores of streams.

12. Cyperus articulatus L. Fig. 144

Coarse, tall perennial with relatively coarse, reddish, scaly rhizomes and colonial. Flowering stems to 1–2 cm across basally, gradually narrowing to the summit, 1–2 m tall, nearly terete and septate, the positions of the septae marked externally by slight horizontal elevations; basally with 2–several loose, open or partially open purple bladeless sheaths, their summits long-acuminate (no bladed leaves). Inflorescence usually with very unequal primary stalks, spikelets glomerulate terminally, or with some of the longer branches secondarily branched. Spikelets narrowly linear, 1.5–3.0 mm wide, 1–4 cm long. Scales shallow-boatlike, mostly rounded on the back, with several nerves either side of the midrib, the one nearest the midrib nearly as long as the scale, outwardly each of the others progressively shorter, the outer half of the side of the scale hyaline; scales about 4 mm long, the lower half oblong then tapering to an acute to obtusish tip; achenes 3-angled, 1.5 mm long or slightly more, oblanceolate in outline, apiculate terminally, the shrivelled style usually persisting to maturity, dark brown, the surface shiny but with very very low rounded papillae.

Brackish and fresh marshes, drainage ditches and canals, borders of swamps, commonly in shallow water. Coastal plain, S.C. to s. Fla., w. to Tex.; trop. Am.

13. Cyperus haspan L. Fig. 145

Tufted perennial, the bases usually soft, occasionally hard. Flowering stems mostly 2–7 dm tall, sharply 3-angled but soft and weak. Leaves basal and consisting of a few loose bladeless often purplish sheaths, these open above and acuminate. Inflorescences vary as to amount of branching, sometimes only with primary stalks bearing sessile glomerules of 2–several spikelets terminally, sometimes with secondary or tertiary branching. Foliar bracts not conspicuous, usually one equalling or somewhat exceeding the inflorescence and 1–several much smaller ones. Spikelets linear, 1 mm wide or a little more, usually about 1.5 cm long fully developed; florets below mature and shed fruits as spikelet elongates and flowering continues above, the achenes usually falling from the scales first, then the scales soon fall. Scales strongly ascending and closely overlapping, 1–1.4 mm long, keeled, with a rather wide green mid-portion usually ending in a soft mucro apically, the sides membranous and usually suffused with reddish purple pigment, often nearly brown at maturity. Achenes obscurely 3-angled, obovate to nearly globose, about 0.5 mm long, sharply narrowed below to a thickish, short stipelike base, apically with a short mucro, the surface papillose but light-reflecting.

In wet places, commonly in shallow water, marshy shores, shallow streams, borders of swamps, swales, alluvial outwash, wet clearings, temporary pools. S.e. Va. to s. Fla., w. to Tex.; Tenn.; pantropical.

14. Cyperus odoratus L. Fig. 146

A coarse annual, the stems solitary or tufted, 1–6 (–9) dm tall, commonly purplish and thick at the base, 1–3 cm, the sheaths broad, rather loose and somewhat spongy. Leaf blades to 1 cm wide or a little wider, the longer reaching the inflorescence. Foliar bracts

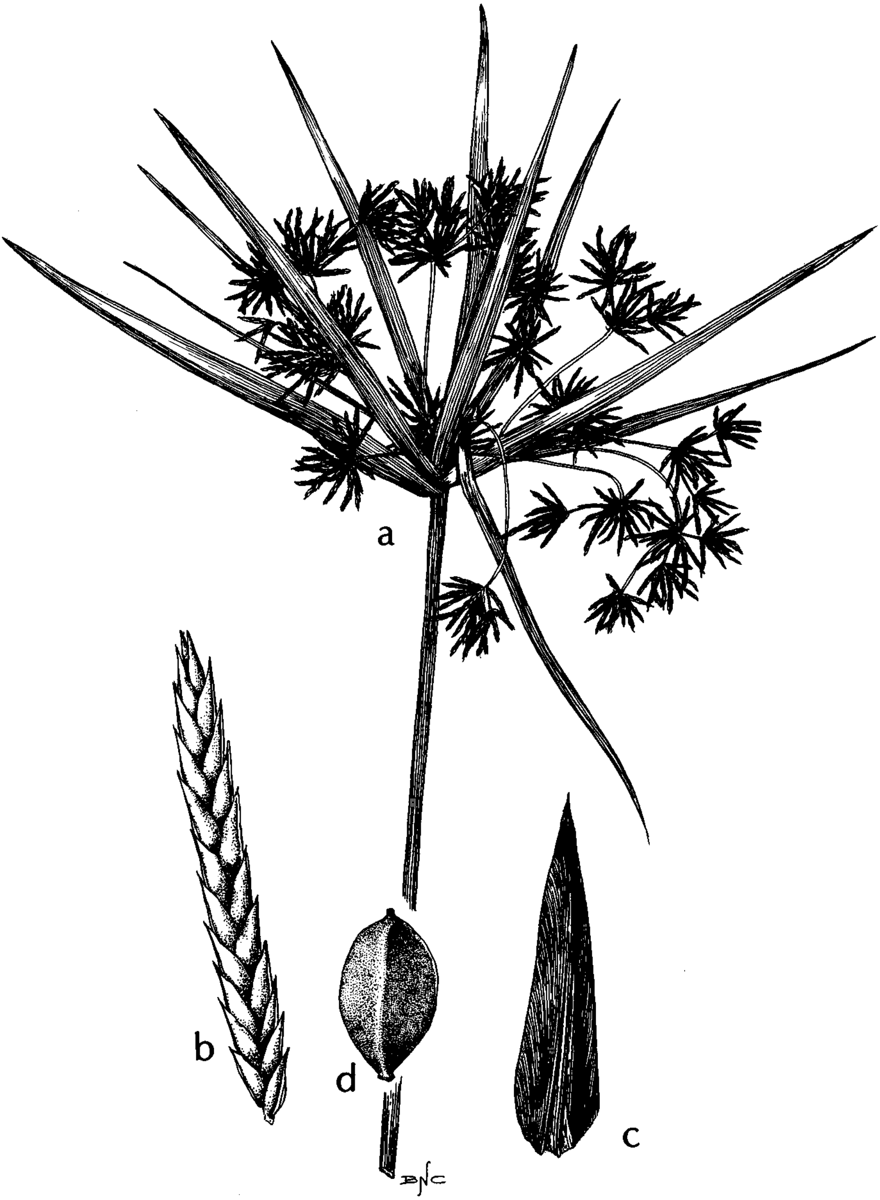

Fig. 143. **Cyperus alternifolius:** a, inflorescence; b, spikelet; c, scale; d, achene.

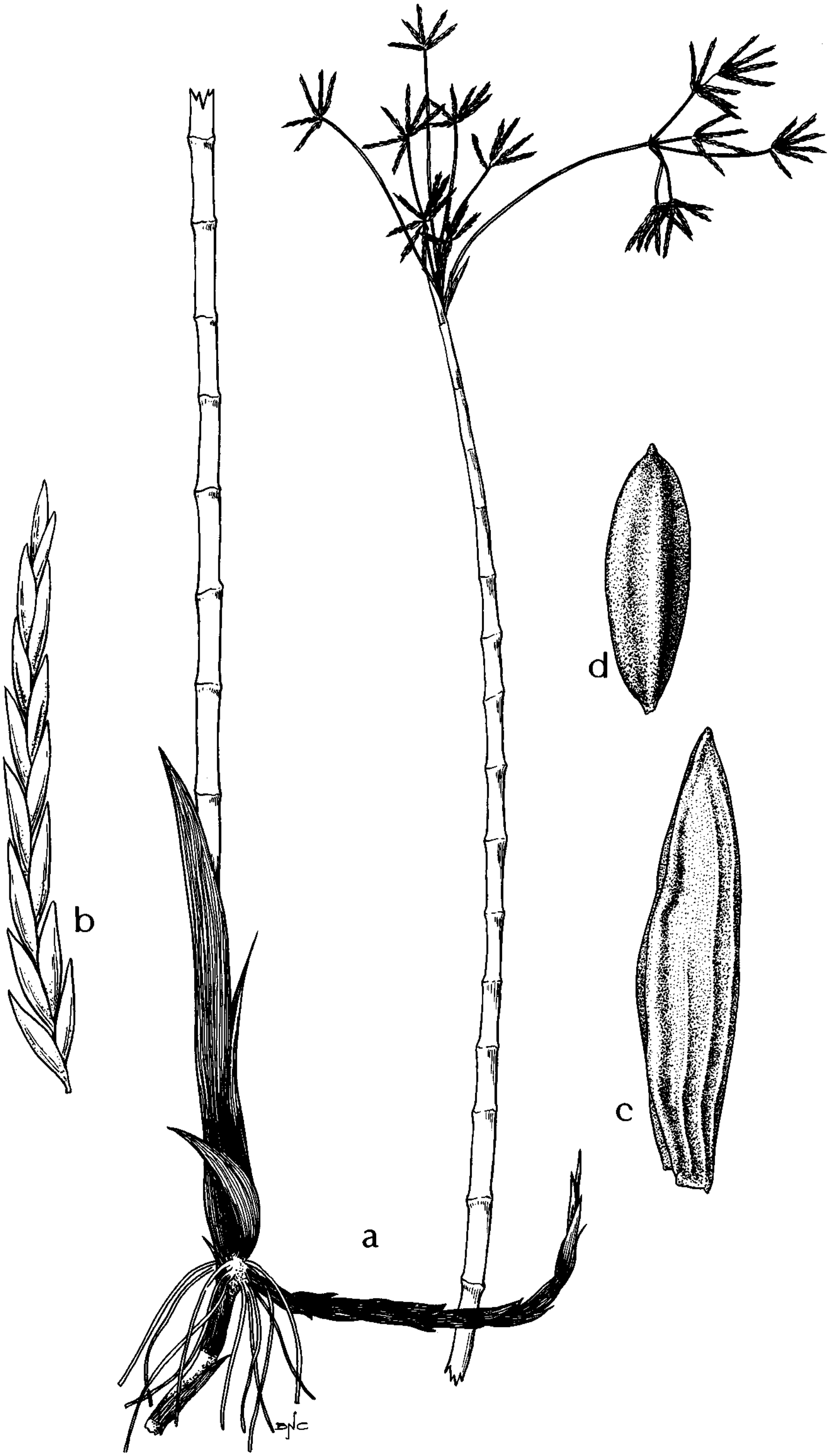

Fig. 144. **Cyperus articulatus:** a, habit; b, spikelet; c, scale; d, achene.

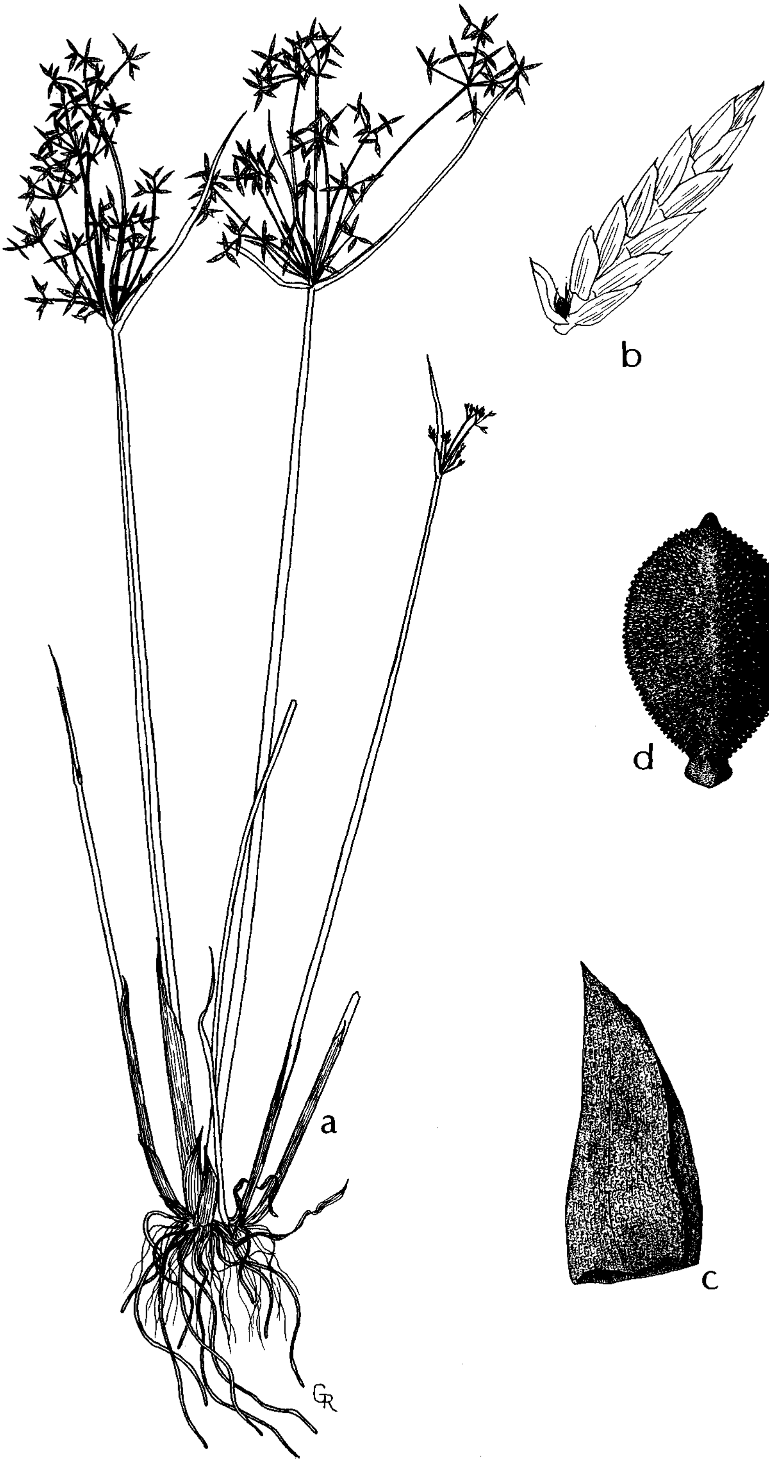

Fig. 145. **Cyperus haspan:** a, habit; b, spikelet, c. scale; d, achene.

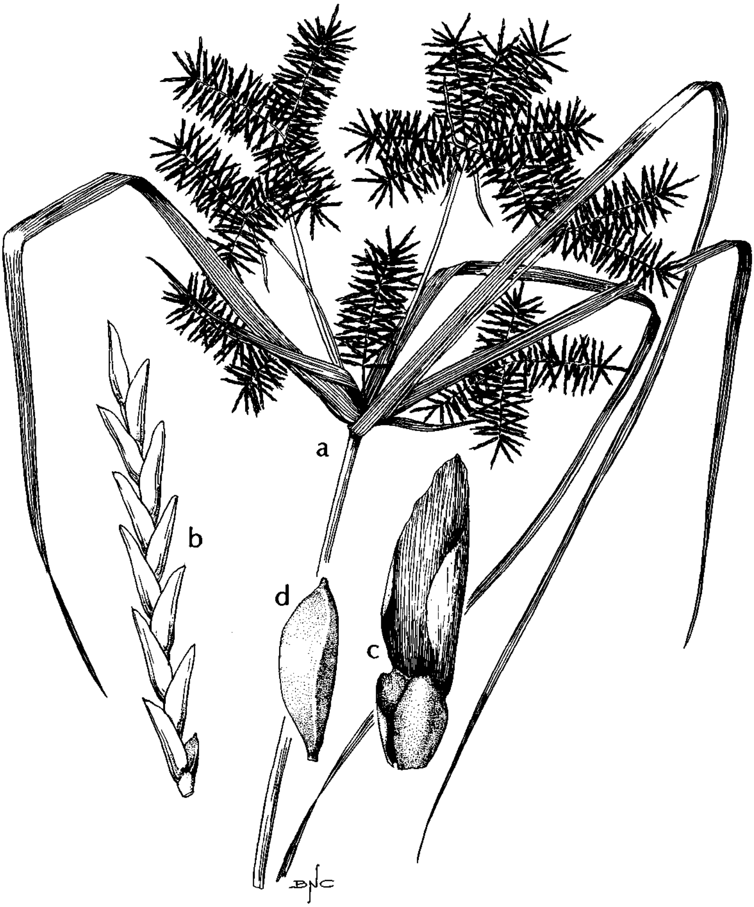

Fig. 146. **Cyperus odoratus:** a, inflorescence; b, spikelet; c, scale; d, achene.

subtending the inflorescence 3–10, conspicuous, the longer far surpassing the inflorescence, to 3 dm long and 1.5 cm wide. Inflorescence fairly variable in overall dimensions, from compact, about 5–6 cm high and broad, to 1.5 dm high and 3 dm broad; with sessile spikes and unequal primary and secondary branches. Spikelets variable in length and number of florets, mostly narrowly linear-acicular, disposed at right angles to the axis and not compact, the axis wide and clasping the achene base; scales closely overlapping, 1.5–3.0 mm long, hard, rounded on the back, oblong, obtuse to acute apically, with a green midrib and chestnut brown nerved sides, somewhat lustrous. Achene 1–2 mm long, 3-angled, oblong or narrowly obovate, often asymmetrical, short-beaked apically, brown, the surface cancellate and somewhat lustrous-iridescent. Spikelet at maturity breaking into joints each comprised of a scale and the short next lower internode clasping the base of the achene. (*C. ferax* L. C. Rich; *C. ferruginescens* Boeckl.)

Marshy shores of rivers, lakes, ponds, borders of mangrove swamps, exposed shores and bottoms at times of low water, edges of swamps, wet clearings, spoil banks and flats. Mass. to Minn., generally southward to Fla., Tex.; w. to Calif.; warmer parts of both hemispheres.

C. engelmannii Steud., apparently very similar to *C. odoratus* and of sporadic occurrence in the coastal plain in our range, differs chiefly in that the scales of the spikelet are disposed so that the tip of one scarcely if at all overlaps the base of the next one above on the same side.

15. **Cyperus aristatus** Rottb. Fig. 147

In stature and general aspect very much like *C. cuspidatus.* Scales of the spikelet with several nerves lateral to the keeled midrib rather than one on either side, the body of the scale tapering gradually into the aristate tip rather than being broadly rounded below the tip; achene obtusely 3-angled, narrowly oblong-obovate, its apex rounded and apiculate, the base minutely stipitate, 1 mm long, about 3 times as long as the width of the apex, nearly olivaceous in color, the surface longitudinally very finely lined with isodiametric cells. (*C. inflexus* Muhl.)

Depressions or pits of rock outcrops, exposed bars and shores of rivers, ponds, and lakes at times of low water, alluvial deposits, fallow fields, ditches. N.B. and Que. to B.C., generally southward more or less throughout the U.S.; s. to Argen. and Chile, W.I., Old World.

Cyperus granitophilus McVaugh, a plant of granite outcrops in the piedmont, N.C. to Ala., is closely similar to *C. aristatus.* Its achene is more broadly obovate, its apex more nearly truncate than rounded, its base without the minute stipe.

16. **Cyperus cuspidatus** HBK. Fig. 147

Diminutive tufted annual, often cushionlike. Flowering stems mostly 2–6 cm tall, sometimes a little taller, terminated by a single glomerule of spikelets, or with a sessile glomerule and some secondary stalked ones. Leaves linear-setaceous, 0.5–1.0 mm wide, the longer reaching the inflorescence. Foliar bracts of the inflorescence 1 to 3–4, setaceous, variable in length, the longer much surpassing the inflorescence. Spikelets linear-oblong, to about 10 mm long fully developed, about 2 mm wide from tip to tip of the scales, the florets ascending and somewhat overlapping, the lower maturing and shedding scales and achenes as the upper develop; in side view body of the scale about oblong, usually falcate, reddish brown, rounded at the summit, the scale folded, with a keeled green midrib which extends as an aristate tip, curved outward beyond the two rounded apices of the body of the scale, a single nerve on either side of the keeled midrib; to the naked eye the outwardly curved awnlike tips of the scales give the spikelet margin a finely pectinate appearance; achenes 3-angled, obovate in outline, about 0.5 mm long, not very much longer than the breadth of the apex, apiculate apically, rusty reddish, the surface very very finely papillose.

Sporadic in occurrence, in moist to wet open places but not by any means restricted

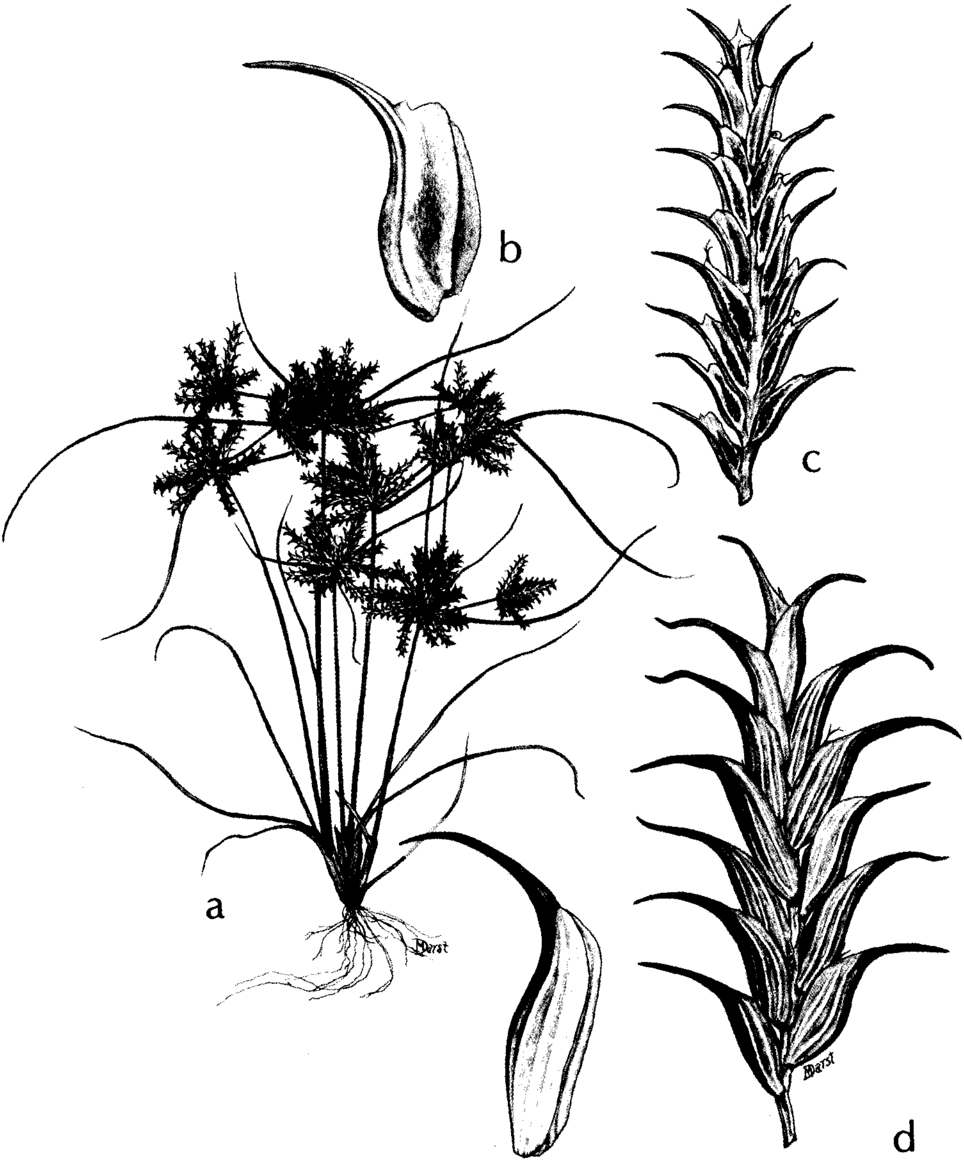

Fig. 147. a–c, **Cyperus cuspidatus:** a, habit; b, scale; c, spikelet; d–e, **Cyperus aristatus:** d, spikelet; e, scale.

to them, usually as a colonizer, alluvial outwash, sandy-peaty soils in areas of mechanical disturbance, banks of ditches and canals, fallow fields, spoil banks, clearings. Coastal plain, S.C. to s. Fla., Ala., perhaps beyond on the Gulf coast; trop. Am.

17. Cyperus globulosus Aubl. Fig. 148

In general aspect and size somewhat similar to *C. retrorsus* though the leaves tend to be longer relative to the flowering stems, reaching the base of the inflorescence, or the longer ones often exceeding it. Spikes 1–2 cm broad, spherical to hemispherical, not cylindric, the spikelets less compacted and diverging in all directions outward so that their tips are held apart, at maturity green, straw-colored or yellowish brown. Spikelets 5–8 mm long, with (3–) 4–6 achene-bearing florets, their tips mostly long-pointed; lowest scale 2–3 mm long; achene 3-angled, about 1.5 mm long or a little more, elliptic-oblong in outline, brown.

In both moist to wet and well-drained places, commonly weedy. Open woods, clearings, floodplain woods, marshy shores, exposed shores of ponds and streams, ditches, waste places. N.J. to s. Fla., w. to Tex., Okla. and Mo.; trop. Am.

Cyperus ovularis (Michx.) Torr. is in general aspect somewhat similar to *C. globulosus.* It may occur sometimes in marginally moist situations but more generally inhabits well-drained upland places such as open woods and fields. It usually has hard bulblike bases, its spikes are compactly globose or just a little longer than broad, at maturity tending to be reddish brown.

18. Cyperus retrorsus Chapm.

Variable in stature and in size of spikes, 2–10 dm tall, the bases sometimes soft, varying to hard and somewhat bulblike, stem glabrous. Leaves mostly shorter than the flowering stems but very variable in size, 5–20 cm long, 2–10 mm wide, smooth or scabrid marginally. Inflorescence bracts 3–8, variable in size, the longer usually much exceeding the inflorescence. Spikes few to numerous, the central sessile, others on stalks of uneven lengths, rarely all sessile or nearly so, mostly cylindric, sometimes subsphaeric, some sometimes branched-lobulate; spikes very variable in size, 0.5–3.0 cm long, 0.3–1.5 cm wide. Spikelets densely compacted into headlike spikes or cylinders, the lower retrorse, 2–5 mm long or slightly more, usually with 1–3 (–4) achene-bearing florets, their tips blunt to pointed; lowest scale 2–3 mm long; achene 3-angled, 1.0–1.5 mm long, elliptic-oblong in outline, surficially finely cancellate, reddish brown but with a grayish cast rendered by the surficial sculpturing.

In a considerable variety of habitats from wet marshy shores, pine savannas and flatwoods, to well-drained sands and clays of pine-scrub oak ridges and hills, stabilized dunes; commonly abundantly colonizing mechanically disturbed places. Chiefly coastal plain, s.e. N.Y. to s. Fla., w. to Tex., cen. Tenn.

Although *C. retrorsus,* as here conceptualized, is a polymorphic complex we fail to be able satisfactorily to delimit segregate taxa either specifically or subspecifically. (Incl. *C. deeringianus* Britt. & Small in Small, *C. nashii* Britt. in Small, *C. plankii* Britt. in Small, *C. pollardi* Britt. in Small, *C. torreyi* Britt., *C. winkleri* Britt. & Small in Small, *C. retrorsus* var. *cylindricus* (Ell.) Fern. & Grisc., *C. retrorsus* var. *robustus* (Boeckl.) Kükenth.) Also sometimes difficult to distinguish from and perhaps grades into, *C. globulosus.*

19. Cyperus ligularis L. Fig. 149

Coarse perennial, usually in large clumps, the hard base of a stem with its surrounding sheaths mostly about 3–4 cm across. Flowering stems about 1 m tall, glaucous, very irregularly low-rounded knobby roughened, at least distally. Leaves relatively numerous about the base of the stem, some with very broad (2–3 cm) open reddish purple sheaths abruptly narrowed at juncture with the blade; blades coarse, hard and stiff, glaucous, mostly channelled, to 1.5 cm wide, the longer reaching or exceeding the inflorescence. Foliar bracts subtending the inflorescence conspicuous, some as long as 3–4 dm, much

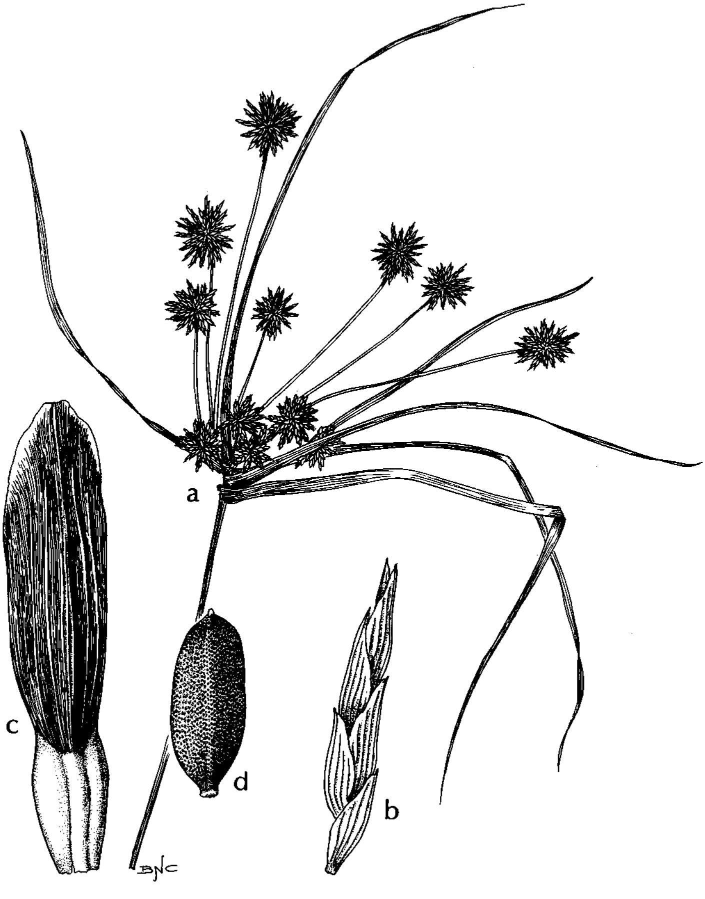

Fig. 148. **Cyperus globulosus:** a, inflorescence; b, spikelet; c, scale; d, achene.

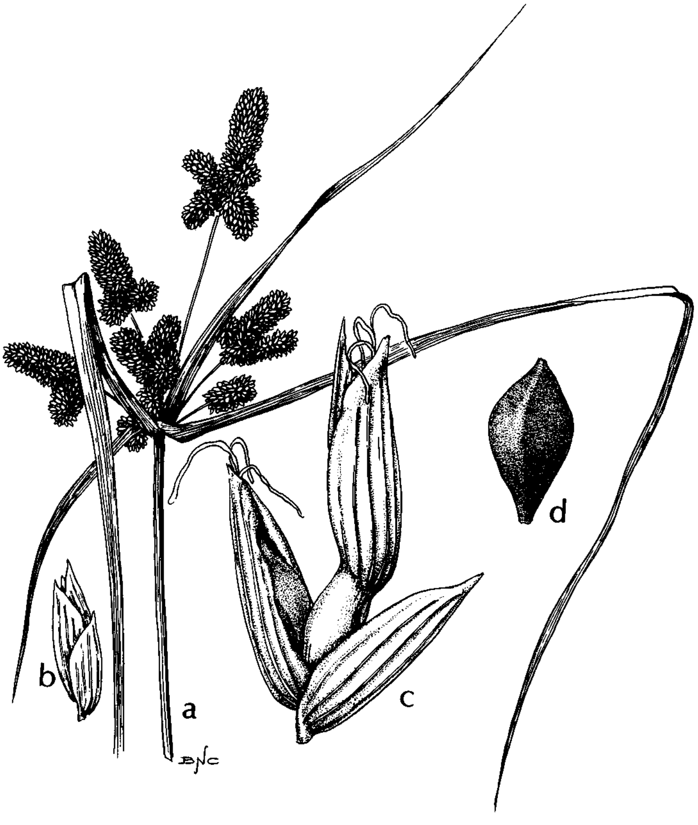

Fig. 149. **Cyperus ligularis:** a, inflorescence; b–c, spikelets; d, achene.

surpassing the inflorescence. Inflorescence with sessile congested headlike spikes and others with stalks of unequal length, most of the spikes irregularly branched-lobulate basally, the lateral lobes short-cylindrical, a longer cylindrical spike above; spikes unevenly rusty, reddish brown and grayish, becoming darkish brown at maturity, the spikelets falling entire. Spikelets congested, extending at right angles to the axis or nearly so, 3–6 mm long, nearly lanceolate, most with 5–6 florets. Scales firm, obtuse apically, several-nerved, surficially with oblong cellular reticulation between the nerves, these grayish, reddish color showing through from below. Achenes 3-angled, nearly 2 mm long, obovate, often asymmetrical, apiculate apically, reddish brown but with a surficial honeycomb cellular layer which peels off irregularly so the surface may appear somewhat crusty-grayish.

Edges of mangrove swamps, fresh and brackish marshy areas, spoil banks and flats, moist to wet swales, ditches, canal banks. Cen. and s. Fla., more common in coastal areas; trop Am.; Afr.

20. Cyperus iria L. Fig. 150

Tufted annual, the bases relatively soft. Flowering stems mostly 1–6 dm tall, sharply 3-angled and stiffish above. Leaves with loose reddish sheaths, the longer blades reaching the inflorescence, variable in width to about 7 mm. Foliar bracts subtending the inflorescence usually 5, very unequal, the longer exceeding the inflorescence and to 7 mm wide. Inflorescence of some sessile and some unequally stalked panicles, the florets on the spikelets ascending, loosely overlapping and to the naked eye tiny-beadlike. Scales keeled, about 1.5 mm long, the midportion green (though the green browning in age), 3-ribbed, the center rib higher than the laterals and apiculate terminally, sides golden, a pale or yellow nerve near to and paralleling the green portion, in side view the scale obovate, the upper half with a pale hyaline margin; achene 3-angled, obovate in outline, not quite filling the loosely enclosing scale, reddish brown.

Often in shallow water, commonly in areas of disturbance, drainage and irrigation ditches, borrow-pits, alluvial deposits, wet clearings, temporary pools, moist fallow fields, marshy or exposed shores. Introduced from Eurasia. Coastal plain, outer piedmont, Va. to s. Fla., w. to Tex., Okla.; Tenn.; W.I.

21. Cyperus rotundus L. NUT-GRASS, COCO-GRASS. Fig. 151

Colonial perennial, rhizomatous, the rhizomes very slender but with tuberous thickenings (to 1 cm across) at intervals or terminally. Flowering stems mostly 1–4 dm tall, occasionally somewhat taller. Leaf blades 2–6 mm wide, flat, usually shorter than the flowering stalk, sometimes reaching the base of the inflorescence. Foliar bracts subtending the inflorescence 2–4, relatively inconspicuous, the longer ones shorter than the inflorescence. Inflorescence usually with a sessile spike and several unequal stalks bearing spikes terminally. Spikelets linear, dark reddish purple or reddish brown, 3–9 per spike, loosely disposed, the lower spreading, the upper ascending, very variable in length from about 1–3 cm. Scales keeled to rounded on the back, with a green medial rib which terminates just back of the bifurcated tip, the sides dark reddish purple or purplish brown, several-nerved near the median, sometimes with a narrow whitish hyaline margin, especially distally; achene 1.5 mm long, 3-angled, obovate or oblong in outline (both shapes even in one spikelet), grayish at maturity, the surface very finely cancellate. In our experience very few achenes are seen to ripen, if any, on any given plant.

A noxious, pernicious, troublesome weed in a wide range of soil types and moisture conditions. Native in Eurasia. Naturalized locally N.Y. to Va., thence common to s. Fla., w. to Tex.; warmer regions elsewhere.

Nut-grass tubers said to be relished by some game animals, particularly wild turkey.

22. Cyperus esculentus L. YELLOW NUT-GRASS. Fig. 152

Perennial with slender rhizomes, the latter sometimes with tuberous thickenings. Flow-

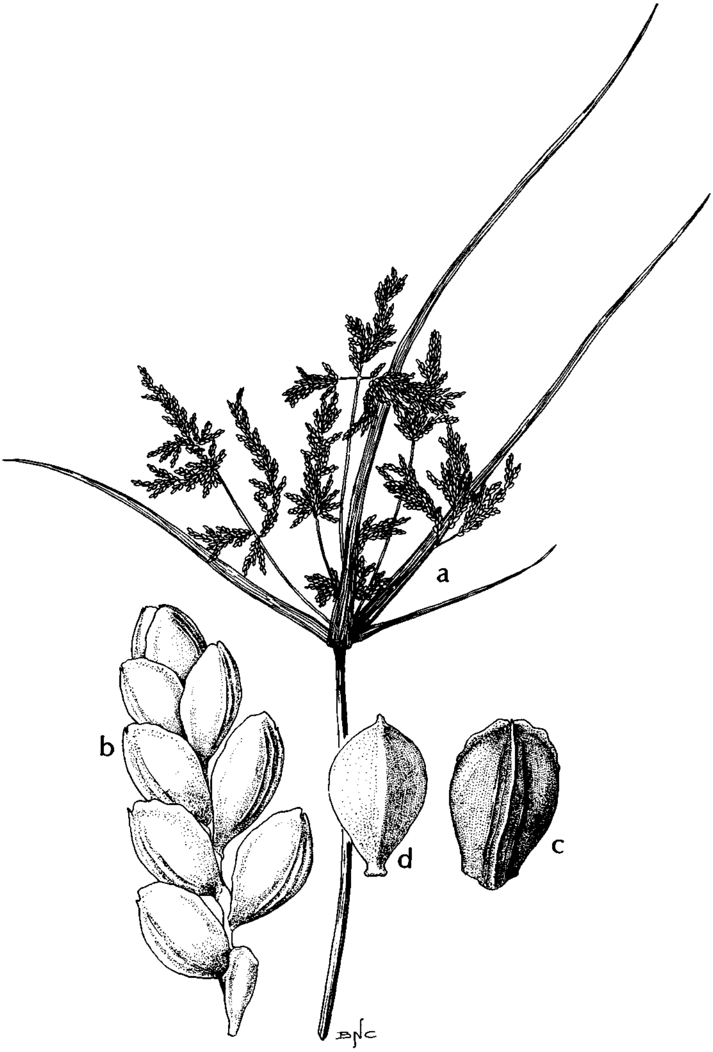

Fig. 150. **Cyperus iria:** a, inflorescence; b, spikelet; c, scale, d, achene.

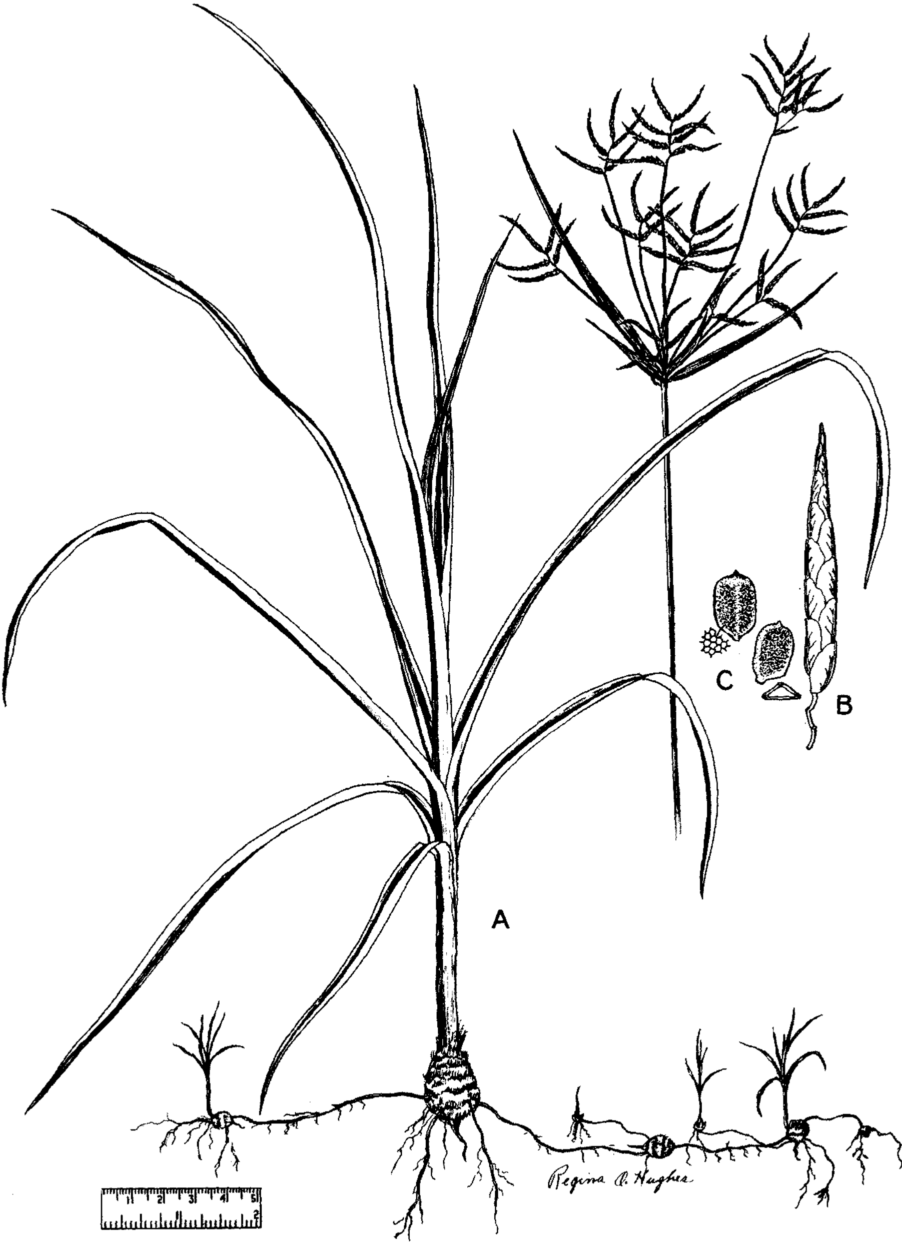
C
B
A
1
2
3
4
5
1
2
Regina O. Hughes

Fig. 151. **Cyperus rotundus:** A, habit; B, spikelet; C, achenes. (From Reed, *Selected Weeds of the United States* (1970) Fig. 47)

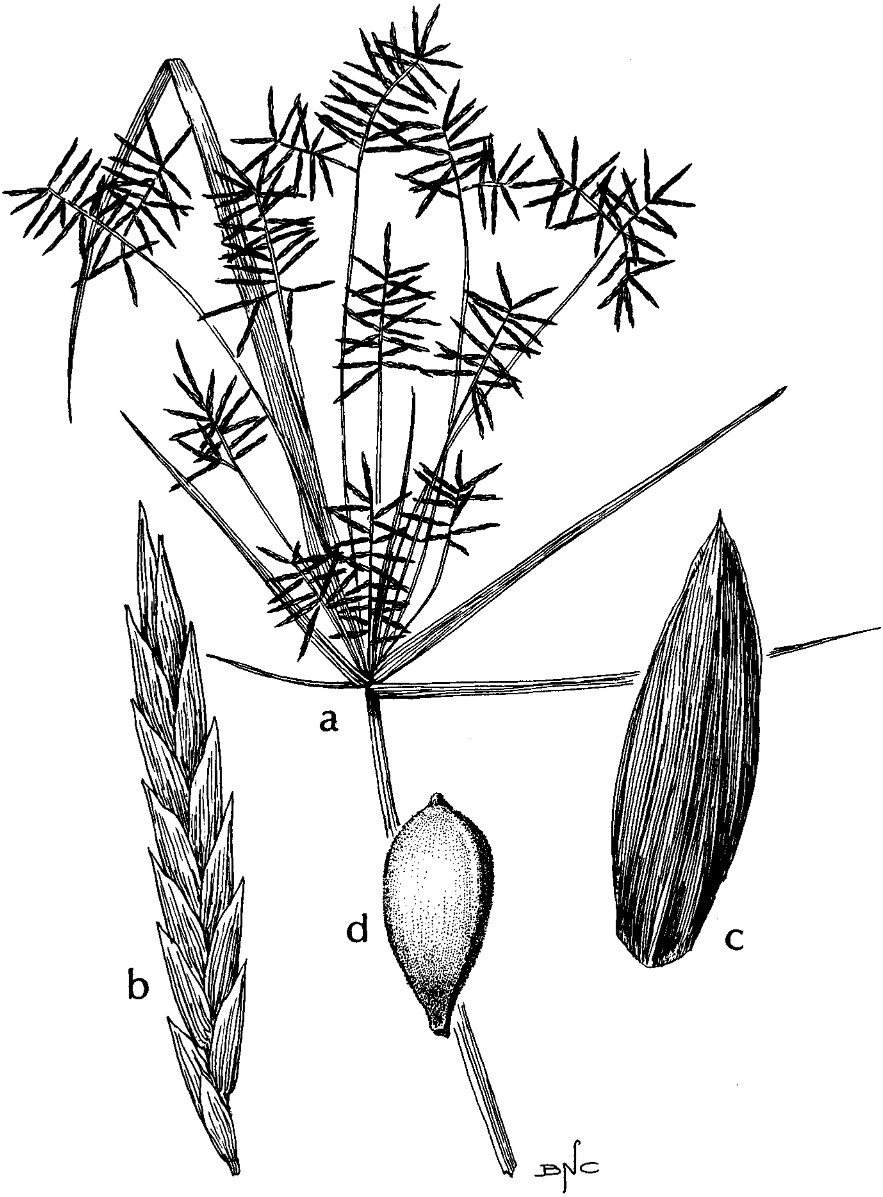

Fig. 152. **Cyperus esculentus:** a, inflorescence; b, spikelet; c, scale; d, achene.

ering stems 2–7 dm tall. Leaf blades usually reaching or exceeding the inflorescence, 2–8 mm wide. Foliar bracts subtending the inflorescence 3–7, conspicuous, the longer ones much exceeding the inflorescence. Inflorescence with a sessile spike and 5–10 unequal stalks bearing spikes or clusters of spikes terminally. Spikelets usually not congested, disposed at right angles to the axis or ascending, linear, 0.5–3 cm long, 1–2 mm wide, with numerous florets but apparently often maturing but few, if any, achenes; scales weakly keeled or rounded on the back, closely overlapping, appressed-ascending, in side view nearly oblong, sometimes ovate, the tips blunt except that the green median may have a short soft mucro terminally; scale 2–4 mm long, buff-brown to golden brown, the sides nerved except for scarious margins; achene 3-angled, brown, when well-developed with one face rounded, the other two flat, 1–1.5 mm long, obovate in outline, about twice as long as broad, minutely apiculate apically, the surface very finely cancellate. Specimens with spikelets having the greatest dimensions are sometimes referred to var. *macrostachyus* Boeckl. (*C. lutescens* Torr. & Hook.)

In some places a troublesome weed in moist cultivated fields; also marshes, boggy areas, shores, sand and gravel bars, ditches, mechanically disturbed soils, waste places. N.S. and Que., w. to Wash., more or less throughout the U.S. southward; trop. Am.; introduced from the Old World. Cultivars with crowded tubers on short rhizomes known as chufas.

23. **Cyperus planifolius** L. C. Rich. Fig. 153

A coarse tufted, glaucous perennial, with hard somewhat swollen and bulblike bases. Flowering stems mostly 7–10 dm tall. Outermost leaves at the base much reduced; sheaths loose and open, reddish purple, the blades stiff, 4–10 mm wide, the longer mostly reaching or even surpassing the inflorescence, scabrid marginally. Foliar bracts conspicuous, the longer very much exceeding the inflorescence. Inflorescence light reddish brown to dark reddish brown, sometimes of several compactly disposed spikes, sometimes open and with a sessile spike, several others on stalks of unequal length, these often lobulate-branched. Spikelets linear-oblong, 6–20 mm long, mostly disposed at right angles to the axis, the lower reflexed, the margins appearing serrated; scales 4 mm long, somewhat overlapping, ascending, rounded on the back below and weakly keeled distally, sometimes weakly keeled throughout, the greenish median ending as a short mucro between a shortly cleft apex, the sides of the scale several-nerved, variously suffused with purplish red pigment; scale firm and with nearly parallel sides below, widening somewhat above the middle, then tapering, the distal margin irregularly hyaline; achene 3-angled, about 2 mm long, usually somewhat oblique-elliptic in outline, with a brownish cancellate surface layer which usually sloughs partially or wholly by full maturity leaving the surface very dark purple-black and very finely papillose on the surface. (*C. brunneus* Sw.)

Essentially maritime, sands and shell-sands, brackish flats, pits and depressions in limerock, borders of mangrove swamps, marly spoil banks and flats. Cen. pen. Fla. s. through the Fla. Keys; W.I., C. Am. to Venez.

24. **Cyperus strigosus** L. Fig. 154

Perennial, often tufted, the base somewhat enlarged, reddish purple and bulblike, this base more apparent perhaps in relatively slender specimens than in very coarse ones with much leaf-sheathing at the base; sometimes flowering the first year from seed. Very variable in stature and in size of the inflorescence; flowering stems 4–10 dm tall, sometimes taller, sometimes shorter, commonly relatively coarse. Leaf sheaths loose and broad, often reddish purple and fibrous, the lowermost sometimes bladeless; blades to about 8 mm broad, somewhat broader in robust specimens, the longer equalling or surpassing the inflorescence. Foliar bracts of the inflorescence 3–10, unequal, the larger usually surpassing the inflorescence, as wide as the leaves, very conspicuous on some specimens. Inflorescence very variable, sometimes relatively simple with a sessile spike and unequal stalks bearing loose spikes terminally, varying to at least secondary

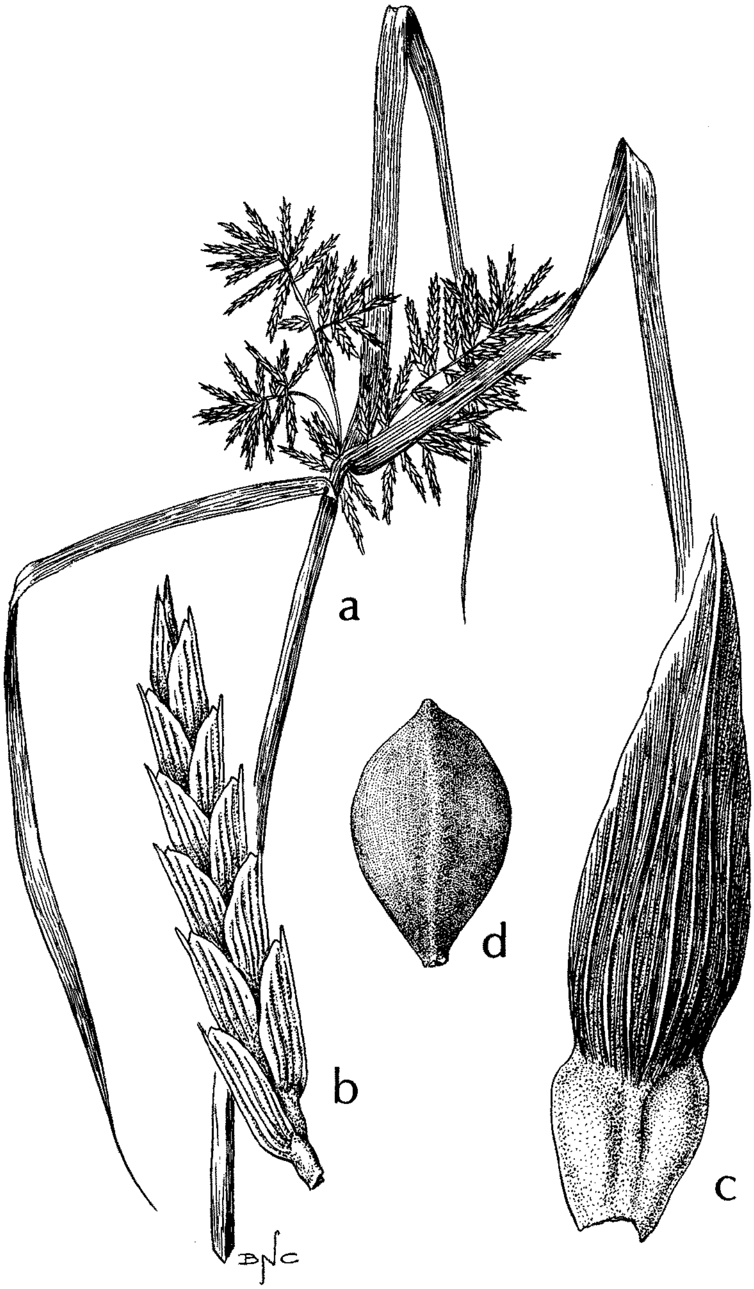

Fig. 153. **Cyperus planifolius:** a, inflorescence; b, spikelet; c, scale; d, achene.

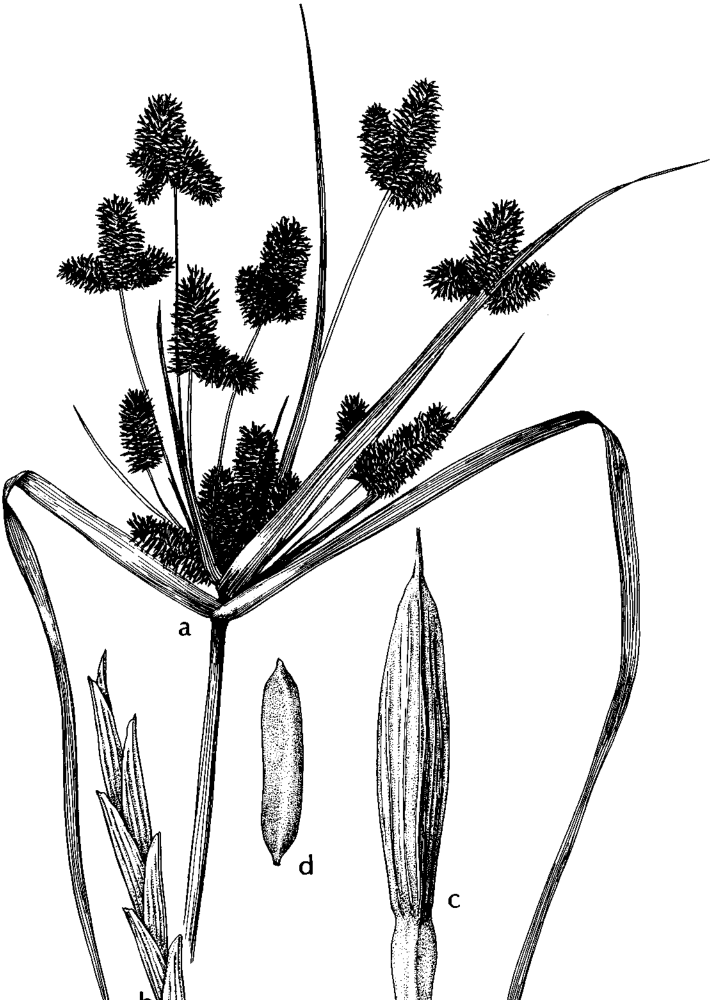

Fig. 154. **Cyperus strigosus:** a, inflorescence; b, spikelet; c, scale; d, achene.

branching; sometimes spikes and spikelets much compacted, sometimes relatively loose and open, the spikelets disposed at right angles to the axis; overall dimensions of inflorescence up to about 4 dm broad and 2 dm high, on the average much smaller, varying down to a few cm broad and high. Spikelets lanceolate to linear, 3–30 mm long (the length about the same on any given plant), pointed apically, the scales appressed-ascending, sometimes somewhat spreading; entire spikelet falling from the axis at maturity. Scales oblong to linear, with a green median, the sides varying from golden yellow to tawny brown, occasionally reddish, several-nerved; achene 3-angled, about 2 mm long, linear-oblong, often curved, apiculate apically, narrowed to a substipitate base, reddish brown to gray, the surface very finely papillose. Specimens with linear-spreading scales referred by some to *C. stenolepis* Torr.

Marshes, bogs, swales, borders of swamps, marshy shores, ditches, canals. Que. and Maine, to Minn., S.Dak., generally southward to s. Fla. and Tex.; Ariz., Pacific States.

25. Cyperus erythrorhizos Muhl. Fig. 155

A (usually) coarse, tufted annual (or perennial in southerly parts of its range), very variable in stature, from 1–12 dm tall, but mostly 4–6 dm, the roots and lower sheaths markedly reddish purple. Leaf blades commonly equalling or exceeding the inflorescence, the larger 8–10 mm wide, rarely to 20 mm, or much narrower on specimens of small stature. Inflorescence with some sessile spikes and usually 4–10 markedly unequal stalks bearing rather elongate unequal spikes terminally, the spikelets close on the axis but not compacted (or rarely so) and mostly diverging about at right angles or slightly ascending; the inflorescence at prime stage of its development a handsome golden brown. Foliar bracts subtending the inflorescence conspicuous, the longer much surpassing it. Spikelets with many small overlapping florets, linear, 4-sided, mostly 5–10 mm long, essentially green-edged owing to the orientation and the green midribs of the overlapping scales, otherwise lustrous golden brown. Achenes mostly ripen together, shedding and leaving axes intact for a time. Scales nearly 1.5 mm long, strongly keeled distally, the green (tawny brown with age) keel forming a short acuminate tip beyond the broadly rounded summit formed by the sides of the scale; in some plants, viewed singly, i.e., when detached, the scale is seen to have a golden-brown stripe (turning reddish with age) parallel to the green midrib and a marked light yellowish brown scarious margin; achene 3-angled, one face rounded, the other two flat, 1 mm long, scarcely twice as long as broad, in outline oblong, broadly elliptic, or slightly ovate, broadly obtuse at the summit, ivory before maturity, becoming dull amber.

In marshes, on marshy shores of ponds, lakes, streams, often colonizing in abundance shores exposed at low water or on moist to wet spoil, edges of swamps, wet clearings, river bottomlands, ditches. Mass. to Ont., Wis., S.Dak., generally southward to s. Fla., Tex., w. to Calif., Oreg., Wash., Utah.

26. Cyperus difformis L.

Tufted annual. Flowering stems 1–5 dm tall, with rather soft bases. Leaf sheaths loose and open, the blades 1–4 mm wide, the longer equalling or surpassing the inflorescences. Inflorescence of single compact, globose or lobulate glomerules, or with some short, unequal branches bearing compact subglobose to lobulate glomerules. Foliar bracts subtending the inflorescence 2–3, very unequal, the longer much exceeding the inflorescence. Spikelets 5 (–8) mm long, linear, the florets tiny and beadlike (to the naked eye), disposed loosely, diverging-ascending and somewhat overlapping, maturing below and shedding scales and achenes as distal florets develop; scales in side view obovate, broadly rounded or broadly obtuse apically, 0.5 mm long or a little more, medially and apically green, the remainder irregularly reddish brown or purplish; achenes about 0.5 mm long, 3-angled, some of them with rounded angles, obovate in outline, narrowed to a truncate base, minutely apiculate apically, pale yellowish, the surface very finely granular.

Muddy banks, reservoir lakes, rice fields. Sporadic, n. Ala., La., Okla., probably elsewhere in the eastern U.S.; N.Mex. to Calif.; Mex. Native in Asia, naturalized here.

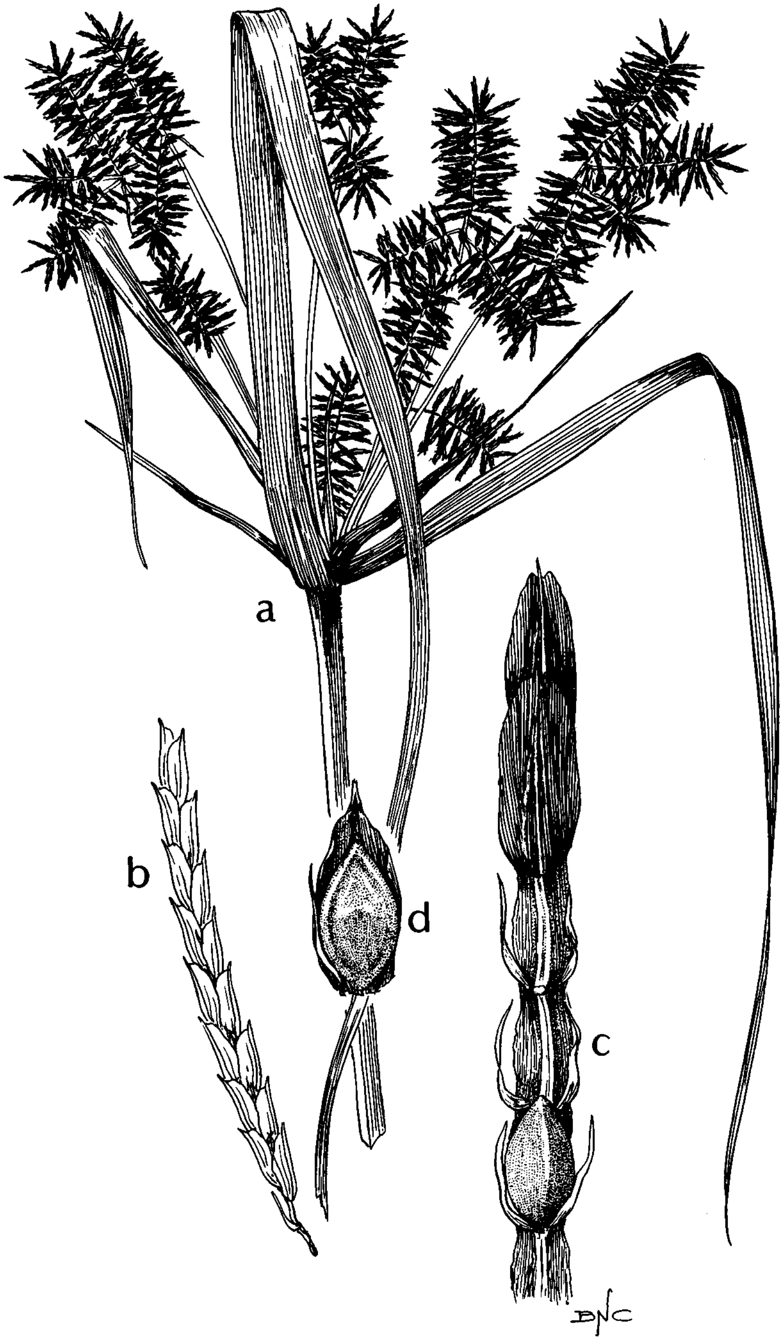

Fig. 155. **Cyperus erythrorhizos:** a, inflorescence; b, spikelet; c, part of a spikelet enlarged; d, scale and achene.

27. Cyperus lecontei Torr. Fig. 156

Perennial, forming colonies by slender, scaly, reddish purple rhizomes. Leaves few, slender, the longer about equalling the inflorescence, with broad loose sheaths, the blades 1–4 mm wide. Flowering stems 2–5 dm tall, smooth. Inflorescence very variable in overall dimensions, in degree of compactness or looseness, in amount of branching, varying from compact and little branched to loose, open, and with tertiary branching. Spikelets in sessile glomerules of from 2–several, flattish, linear-oblong, variable in length from 5–30 mm and consequently with relatively few to many florets. Scales greenish to straw-colored, or sometimes (even in a single spikelet) some but not all variously suffused with reddish brown or purplish pigment; keeled, closely overlapping, usually several-nerved but the margins scarious, in side view nearly ovate, the apices somewhat hooded and bluntish, mostly 2–3 mm long. Achenes (apparently not always forming) 3-angled, broadly elliptic in outline, not a great deal longer than broad, about 0.7–0.8 mm long, brown, surface smooth, filling about ⅓ of the enclosing scale.

Sandy or sandy-peaty wet soils, exposed shores of ponds and lakes, shores of estuaries, estuarine creeks and inlets, interdune hollows, ditches. Coastal plain, s.e. N.C. to s. Fla., w. to La.

Note: *Cyperus dentatus* Torr. is similar in habit to *C. lecontei.* It too is rhizomatous and colonial, usually matures few achenes. Its spikelets mostly do not exceed 1 cm in length (occasionally to 2 cm) whereas those of *C. lecontei* are seldom that short at maturity; scales of *C. dentatus* are tipped by a subterete outcurving mucro which makes the spikelet edge appear finely serrated; contrastingly the scales of *C. lecontei* are blunt terminally and somewhat hooded, not outcurving, so that the edge of the spikelet is smooth. *C. dentatus* is apparently mainly distributed from Md. to N.S. and Que. but is reported locally in W.Va., Ind., N.C. and s.w. Ala.

28. Cyperus surinamensis Rottb. Fig. 157

Tufted perennial (flowering the first year from seed). Usually relatively slender, the flowering stems mostly 3–6 dm tall, rarely a little taller, usually exceeding the longer leaves; surface of the scape (seen best near the summit) with relatively distant and scattered, short, retrorse scabrosity, this sometimes only on or near the angles, sometimes over the surface generally; many of the trichomes are deciduous, each usually leaves a darker spot on the stem. Inflorescences vary considerably in overall dimensions (maximally about 10 cm high and 15 cm broad) in part owing to the fact that much increase in size occurs between commencement of and completion of flowering; the branches elongate during a protracted flowering period, the spikelets elongating as well, flowering progressively upward from the base, ripened achenes and their subtending scales being shed below the while; inflorescence ultimately with very unequal primary stalks, the shorter ones bearing glomerules of sessile spikelets, the glomerules becoming more or less spherical in outline, the longer stalks usually rebranch distally, the secondary branches also unequal in length but none of them very long. Foliar bracts subtending the inflorescence unequal, narrow, the larger to 15 cm long and 3 mm wide. Spikelet flat, axis usually eventually reaching about 1 cm long, florets numerous; scale-bearing portion of the spikelet at any given time broadest at base, about 2 mm wide, tapering distally; fully developed scales keeled, about 1.5 mm long, in side view twice as long as wide, nearly twice as long as the enclosed achene; achenes 3-angled, about 0.8 mm long, nearly oblong in outline, reddish brown, granular surficially, basally with a very short and tiny darkened stipe, apiculate apically.

Marshy open shores of ponds, lakes, streams, river bars and shores, temporary pools, alluvial outwash, wet clearings, ditches, sloughs. S.C. to s. Fla., w. to Tex.; trop. Am.

29. Cyperus virens Michx. Fig. 158

Tufted perennial, relatively coarse, somewhat stouter than *C. robustus* and the inflores-

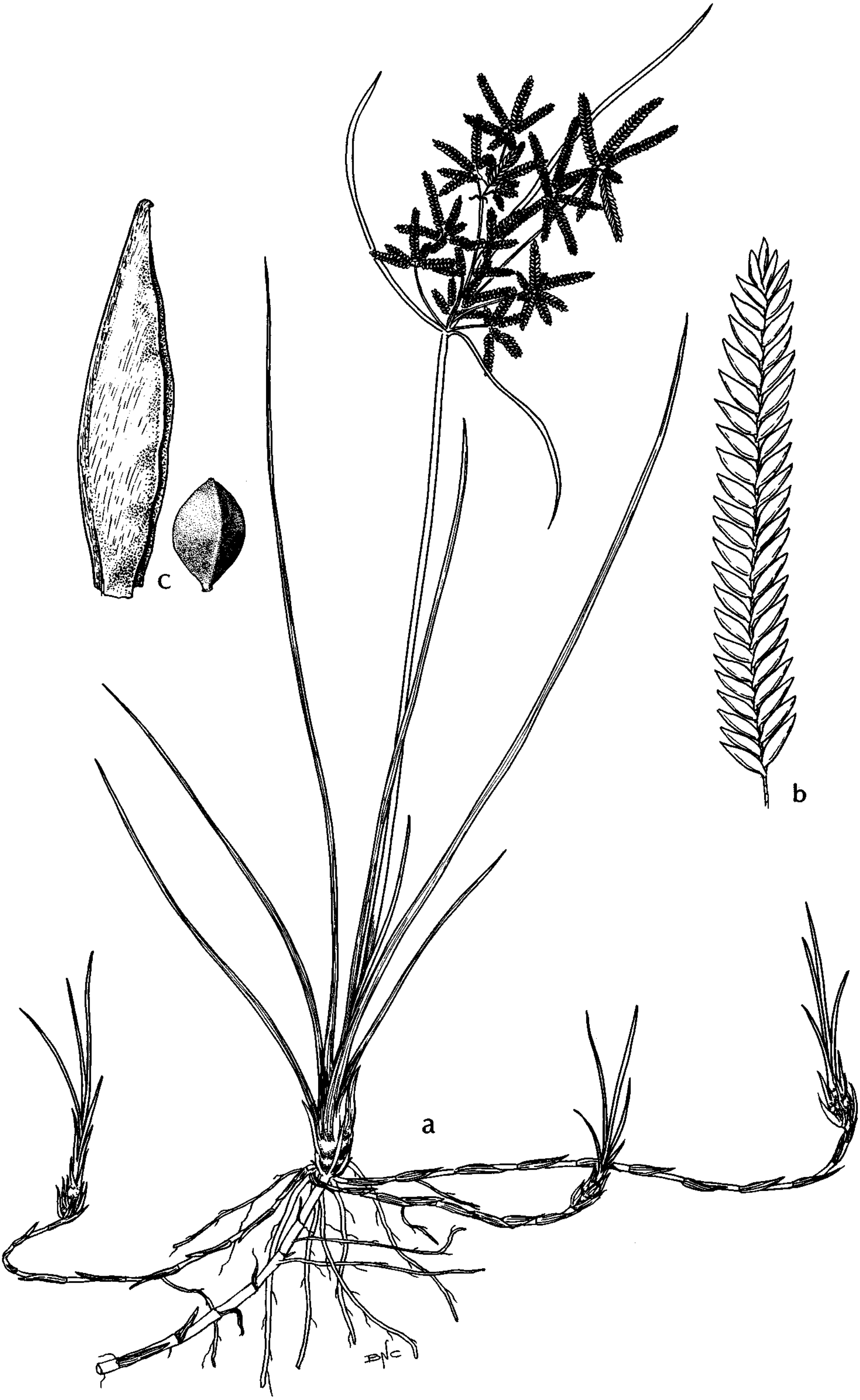

Fig. 156. **Cyperus lecontei:** a, habit; b, spikelet; c, scale and achene.

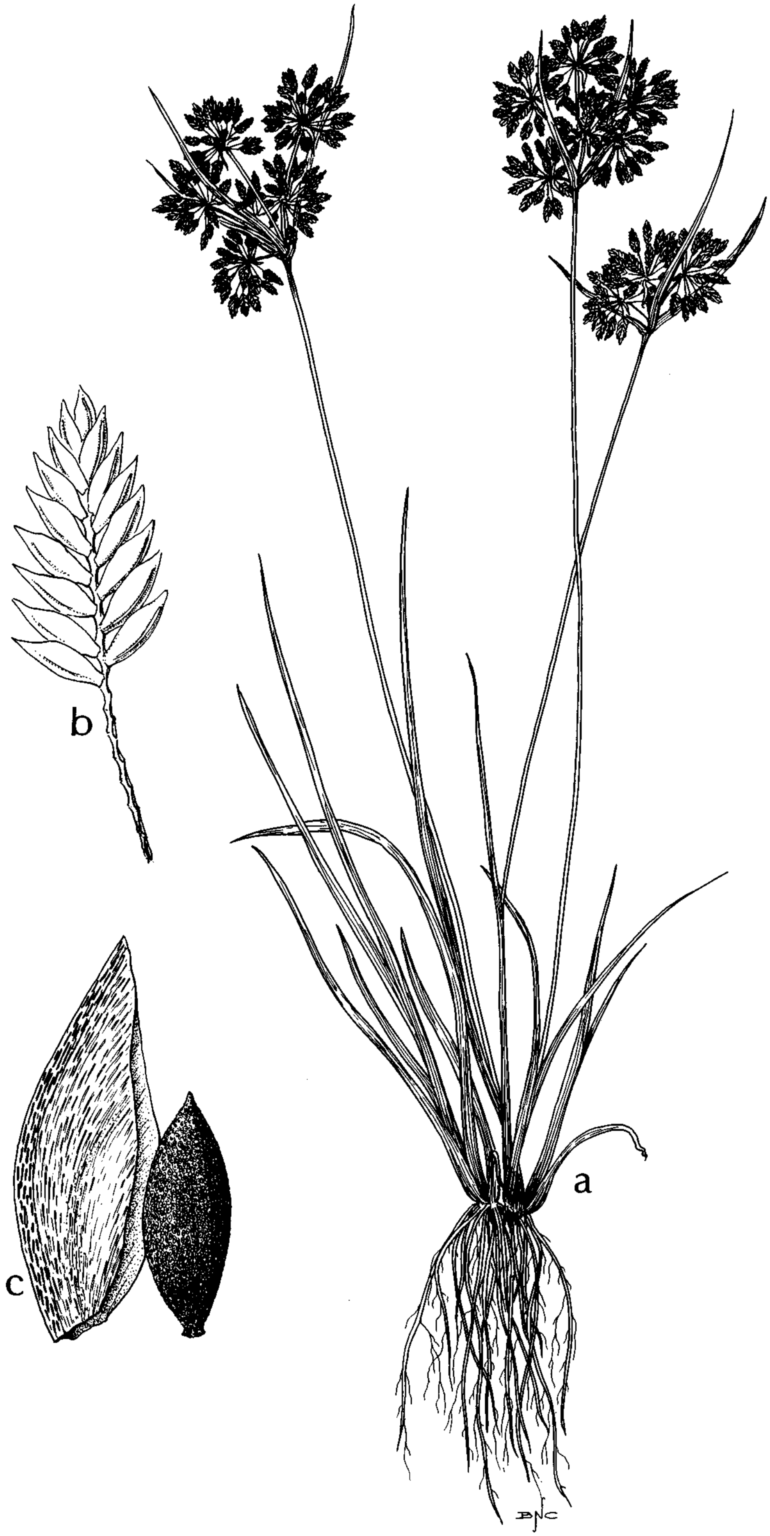

Fig. 157. **Cyperus surinamensis:** a, habit; b, spikelet; c, scale and achene.

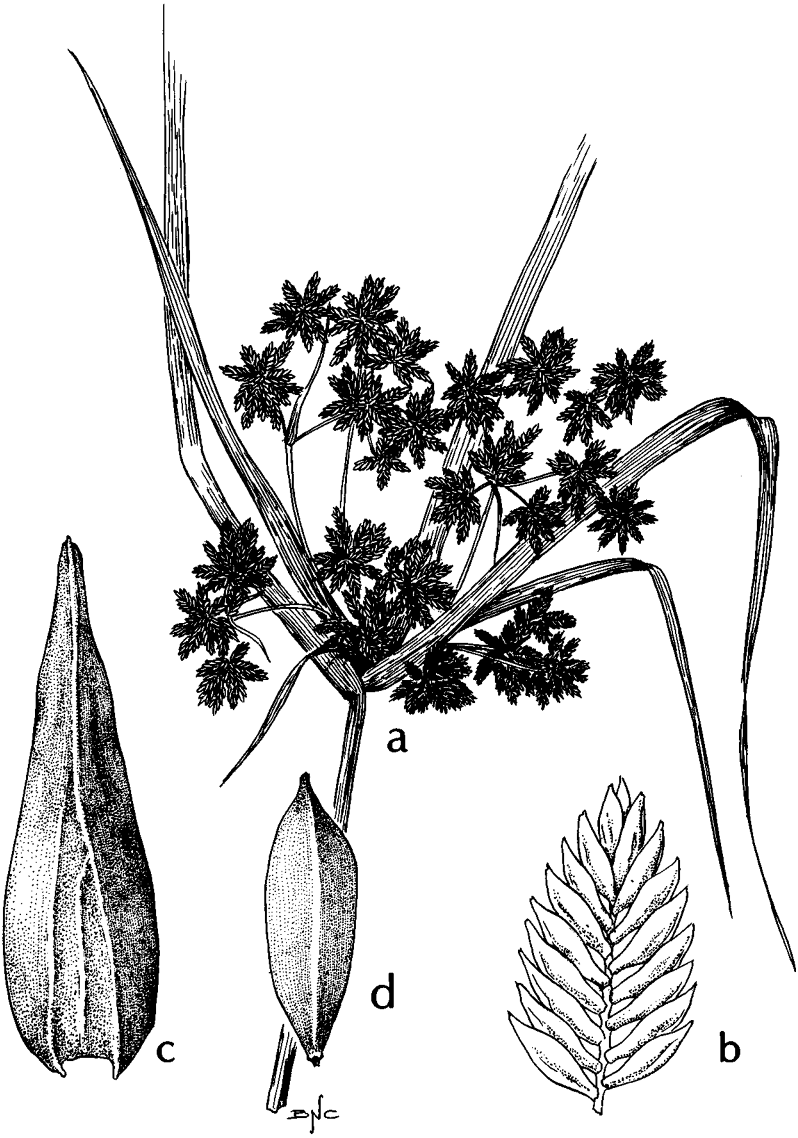

Fig. 158. **Cyperus virens:** a, inflorescence; b, spikelet; c, scale; d, achene.

cence more open and more branched. Flowering stems mostly 6–10 dm tall or a little taller, sharply antrorsely scabrid with hooked teeth, sometimes the teeth sloughed or partially so, the angles then "bumpy." Longer leaves about equalling the inflorescence. Foliar bracts unequal, the larger to about 30 cm long and 12–15 mm wide. Inflorescences 8–10 cm high and to about 15 cm broad, the branching pattern and development as in *C. surinamensis.* Spikelets to 15 mm long, their bases 2.5–3.0 mm wide; scales mostly a little over 2 mm long, thrice as long as broad or a little more, long-acute or acuminate, the scale twice the length of the enclosed achene and securely enveloping it so that they are not easily separated; achene 3-angled, about 1.2 mm long, elliptic-oblong in outline, narrowed to a short-stipitate or substipitate base, apically apiculate, surficially very finely longitudinally lined with isodiametric cells, maturing to a grayish or coppery iridescent color.

Marshy shores of ponds, lakes, streams, cypress-gum ponds or swamps, wet clearings, ditches. N.C. to cen. Fla., w. to Tex., Okla.; W.I., Mex. to Argen.

Some authors have incorrectly applied the name *C. virens* to *C. pseudovegetus.*

30. **Cyperus robustus** Kunth.

In general aspect similar to *C. surinamensis* but somewhat coarser and taller, mostly 6–10 dm tall. Longer leaves mostly reaching or exceeding the inflorescences. Flowering stems antrorsely scabrid on the angles, especially below the inflorescences, the trichomes often with the short tips having been shed, or shed completely, in the latter case the margins of the angles just roughened. Inflorescence similar but relatively compact, not always with secondary branching; foliar bracts subtending the inflorescence coarser and attaining greater length, the larger to 30 cm long and 6 mm wide. Spikelets 2 mm wide at base; scales 1.5–2.0 mm long, in side view twice as long as broad, oblong or ovate-oblong, short-acuminate apically, the mature achenes held loosely in the scales and easy to remove, filling the scale to the base of the acuminate tip; achene little more than 1 mm long, oblong-elliptic in outline, somewhat narrowed basally but not stipitate, apically short-acuminate or apiculate, grayish and iridescent, surficially with very fine longitudinal lines of isodiametric cells.

Marshy shores of ponds, lakes, temporary pools. N. Fla.

31. **Cyperus distinctus** Steud. Fig. 159

In general aspect and stature, character of inflorescence and spikelets, very much like *C. virens.* Flowering stem without scabrosity, the angles very smooth. Scales of the spikelets clasp the achenes closely but rather less so than in *C. virens.* Achenes 3-angled, the body linear-oblong, about 1 mm long, narrowed slightly at the base then subtended by a whitish spongy callosity usually with as great a diameter as that of the achene; apically the achene abruptly slender-beaked, the beak often with the style persisting on it until maturity, or even until after shedding; achenial surface smooth, usually rather dark brown, shiny but not iridescent. Achene, including basal callosity and beak, as long as the subtending scale or nearly so.

Marshy shores of ponds, lakes, canals, streams, depressions in pine savannas and flatwoods, wet or wettish sandy-peaty clearings and ditches. Coastal plain, s.e. S.C. to s. Fla., w. in the Florida Panhandle to about the Apalachicola River, (s.e. Ala. ?).

32. **Cyperus pseudovegetus** Steud. Fig. 160

Somewhat similar to *C. virens* and *C. distinctus* but much more slender. Inflorescence branching as in those two but the glomerules of spikelets compact and with a lobulate-knobby and burlike appearance (to the naked eye), the scale tips being outcurved; individual spikelets short, compact, the scales and their enclosed achenes falling tardily. Achenes 3-angled, linear-elliptic in outline, usually somewhat falcate, the body slightly over 1 mm long, narrowed below to a short, slender, stipelike base, this often darkened and tiny-knoblike at its extremity but not nearly attaining the diameter of the achene and not with the whitish spongy-callus texture as in *C. distinctus;* summit of achene

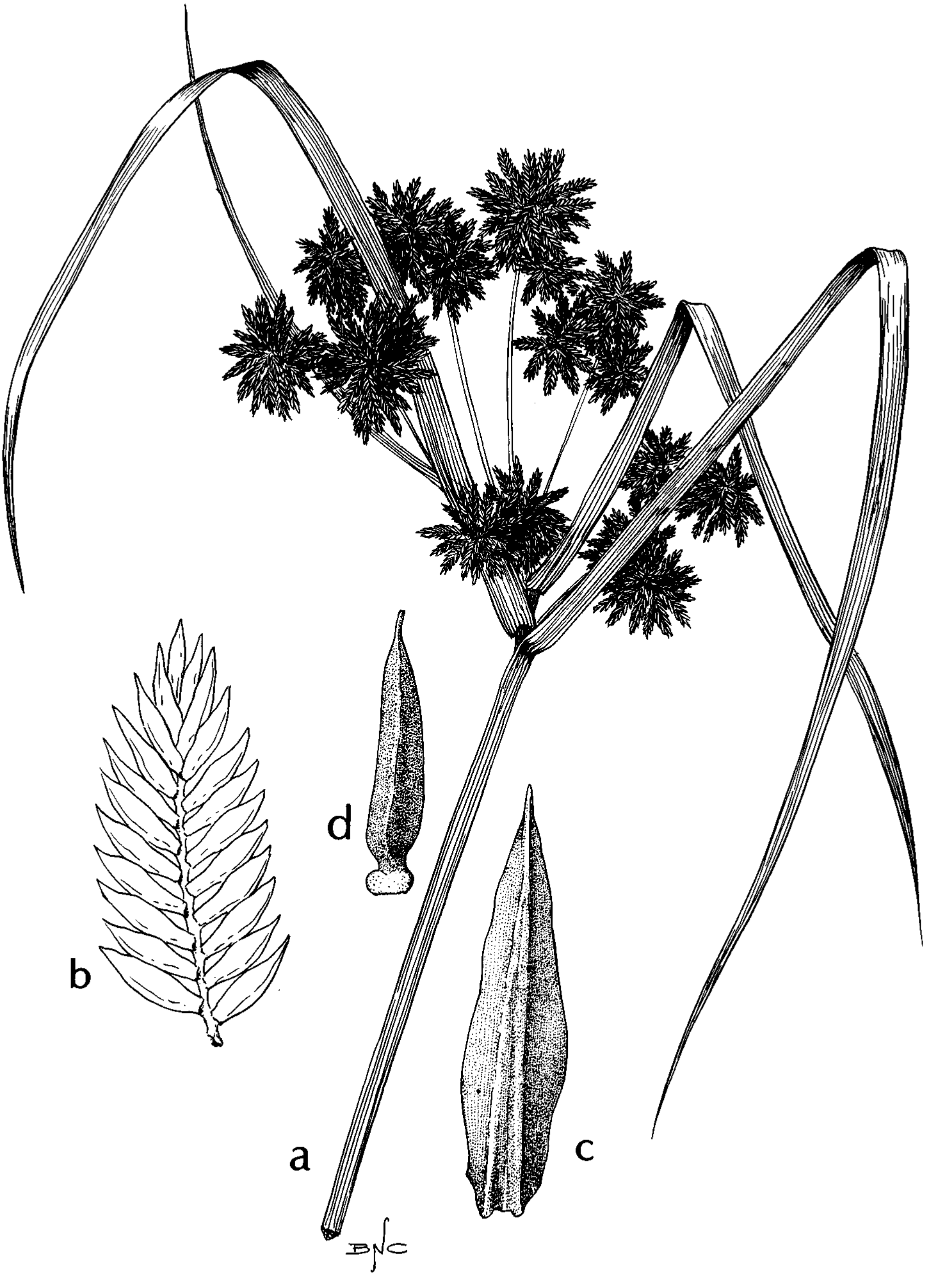

Fig. 159. **Cyperus distinctus:** a, inflorescence; b, spikelet; c, scale; d, achene.

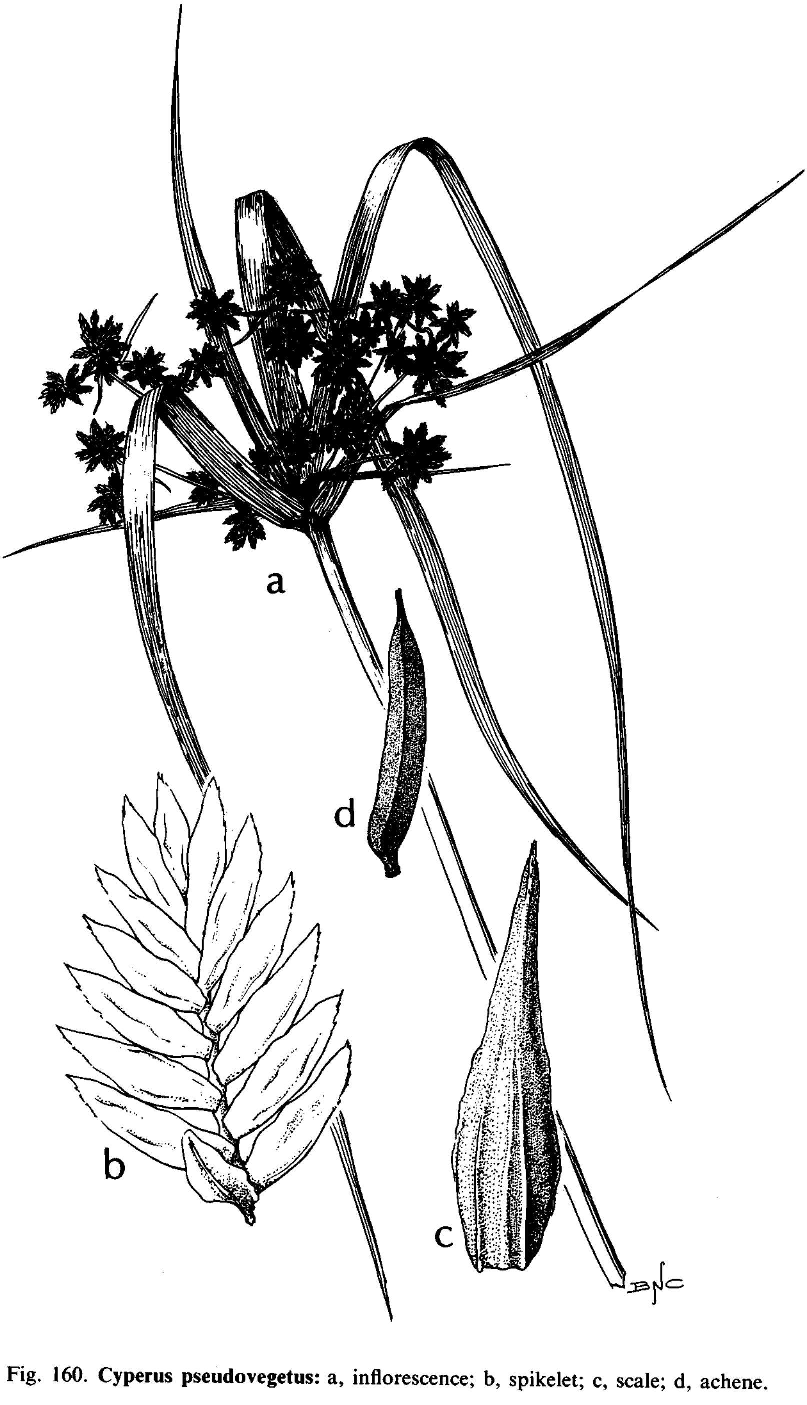

Fig. 160. **Cyperus pseudovegetus:** a, inflorescence; b, spikelet; c, scale; d, achene.

apiculate or short-beaked, the surface grayish, sometimes slightly crusty and with very very fine longitudinal lines of isodiametric cells.

Wet marshy clearings, swamp forests, marshy shores, alluvial outwash, ditches, sloughs, swales. S. N.J. to Ind., Ill., Mo., Kans., generally southward to n. Fla. and Tex.

33. **Cyperus acuminatus** Torr. & Hook.

Tufted perennial (flowering the first year from seed), the bases relatively soft. Flowering stems thin-wiry, 1–4 dm tall, striate, smooth. Leaves narrow, mostly 0.5–1 (–2) mm wide, the longer ones usually reaching the inflorescence. Foliar bracts subtending the inflorescence narrow but conspicuous, the longer to 15 cm long. Inflorescence usually with a sessile glomerule of spikelets, sometimes more than one, often with 1–several unequally stalked glomerules, the glomerules compact, mostly globose or ovoid. Spikelets to about 10 mm long, greenish, then straw-colored at maturity, broadest at the base and somewhat narrowing upward, the scales closely overlapping and at maturity their distal portions turning outward giving their edges a finely pectinate appearance to the naked eye; lower florets maturing and shedding achenes and scales as spikelet elongates, flowering distally. Scales in side view lanceolate-acuminate, their tips curved outward, the bases curved inward, thus very weakly **S**-shaped; nearly 2 mm long, the thickish midportion keeled and with a strong pale nerve at its edge on either side, the sides translucent but honeycombed-cellular, sometimes becoming golden-colored; scales enclosing the achenes loosely; achene filling about ⅔ of the scale, 3-angled, about 1 mm long, often somewhat asymmetric, about elliptic in outline, tapered gradually below to a thin stipelike base, apically tapered about the same but a bit of the base of the style often weakly persisting making it look beaked.

In wet soils, in areas of limestone exposure in depressions or pits. Cen. Tenn., Mo., to La., Tex., Ariz., Nev., Calif., Oreg.; n. Coah.

34. **Cyperus ochraceus** Vahl. Fig. 161

Tufted perennial. Flowering stems 1–8 dm tall, smooth. Longer leaves about equalling the flowering stems, to about 7 mm wide. Inflorescence varying from compact with short primary stalks only to loose and open with very unequal primary stalks, the latter usually branched secondarily. Spikelets linear-oblong, straw-colored, 2–2.5 mm wide, to about 1.5 cm long fully developed, lower florets maturing and shedding scales and achenes as upper ones develop; scales diverge laterally, the tips ascending, closely set at first, loosely set at maturity, in side view ovate-acuminate, with a prominent nerve close to the midrib on either side, prominently cellular-reticulate laterally from the nerve, the very margins hyaline; scales about 2 mm long, loosely enclosing the achene; achene body obscurely 3-angled, ovate to elliptic in outline, abruptly narrowed below to a stipelike base, more gradually narrowed apically to an acuminate beak, 1.0–1.5 mm long overall, dark brown to blackish at maturity but appearing more grayish iridescent because of light-reflecting honeycombed surface cells.

Wet soils, marshes, muddy or marshy shores. S. Fla.; La., Tex.; Mex., C.Am., W.I.

35. **Cyperus elegans** L. Fig. 162

Tufted perennial. Flowering stems 3–10 dm tall, both the stems and leaves sticky when fresh. Leaf sheaths relatively broad and somewhat spongy, having within short cross-septae separating long rectangular chambers; blades folded, the longer reaching or surpassing the inflorescence. Inflorescence with a sessile glomerule and several unequally stalked ones, or the stalks sometimes secondarily branched; the glomerules mostly compact and spherical or subspherical in outline. Spikelets 5–15 mm long fully developed, broadest at the base (4–5 mm wide), tapering gradually to the summit, the lower florets maturing and shedding scales and achenes as flowering occurs distally; scales somewhat keeled, the keel sometimes smooth, sometimes scabrid or glandular, firm, orange grayish to brown, in side view obliquely ovate, several-nerved, apically acuminate; achene 1.5 mm long or a little more, 3-angled, obovate in outline; apiculate

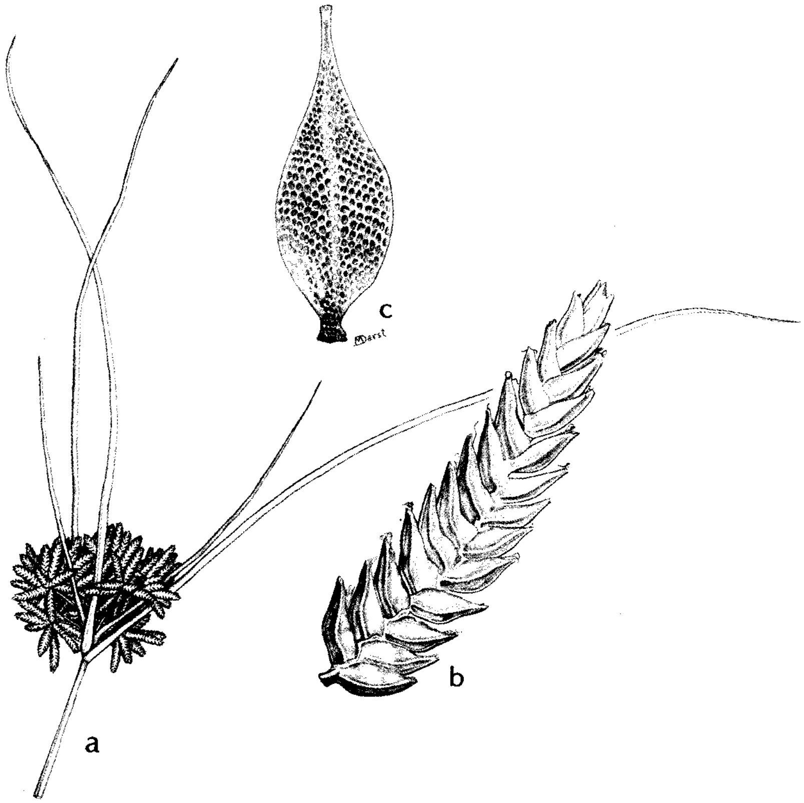

Fig. 161. **Cyperus ochraceus:** a, inflorescence; b, spikelet; c, achene.

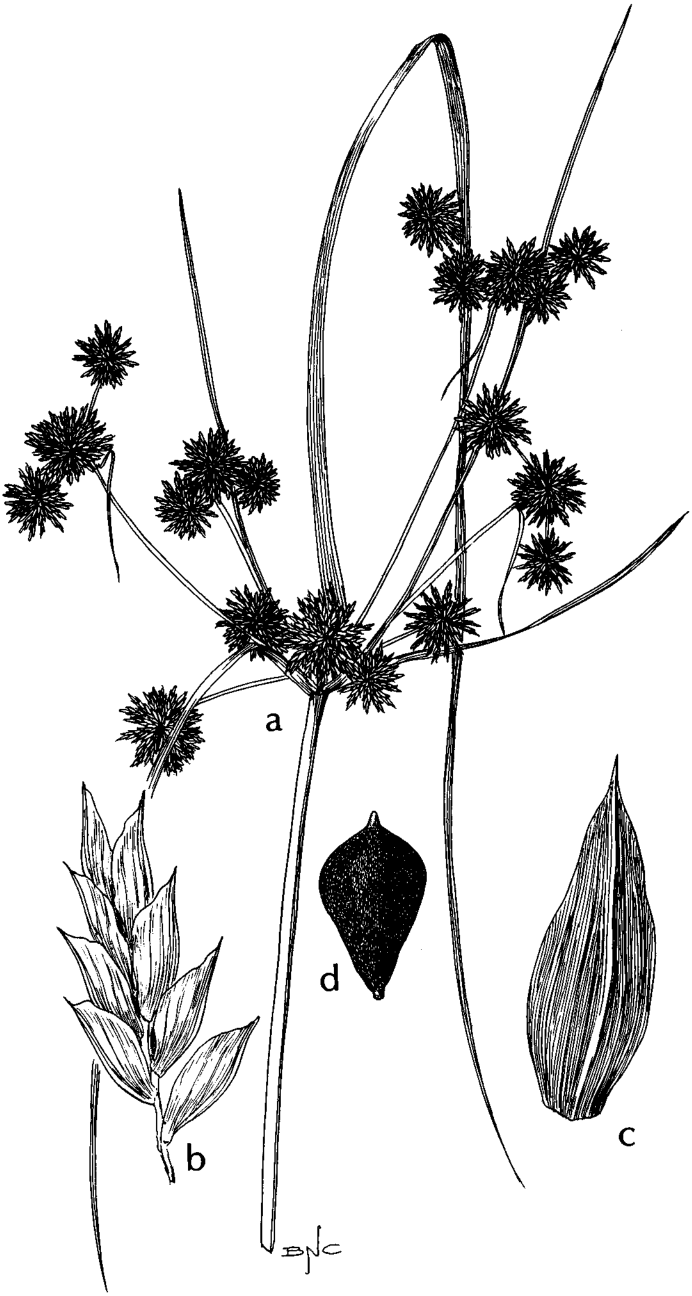

Fig. 162. **Cyperus elegans:** a, inflorescence; b, spikelet; c, scale; d, achene.

apically, narrowed from the widest portion to a pointed base, black but with a very thin cellular overlay which is grayish, somewhat iridescent and sloughs leaving the surface irregularly black-crusty.

Marshy shores, ditches, sands and gravels of creek beds. S. Fla.; La. and Tex.; Mex., C.Am., W.I.

36. Cyperus oxylepis Nees ex Steud.

In stature and general aspect somewhat like *C. elegans,* similarly sticky when fresh, the leaf sheaths similarly chambered but somewhat less spongy, the blades folded. Glomerules of spikelets not nearly so compact, the spikelets though broadest basally only slightly so thus nearly linear-oblong. Florets with intervals between them along the spikelet axis, about half-overlapping, the tips of the scales disposed so the spikelet margin appears serrated; scales in side view obliquely lanceolate, acuminate apically, incurved below, out-curved distally thus weakly **S**-shaped; median portion of the scale straw-colored to golden yellow, the sides more solidly golden yellow to golden brown—the spikelets and glomerules, to the naked eye, when in prime condition, attractively golden; achene 2 mm long or a little less, 3-angled, oblanceolate in outline, narrowed at base to a short stipe, this sometimes knoblike, beaked at the summit, amber.

Marshy shores, wet clearings, ditches, moist to wet places where soil mechanically disturbed, sometimes in shallow water. La., Tex.; Mex. to Ecu., Parag., Argen.

37. Cyperus compressus L. Fig. 163

Tufted annual, with few to very many stems to a tuft. Flowering stems 0.5–4 dm tall. Leaf blades mostly 1–2 mm wide, the longer about equalling the inflorescence, the sheaths commonly reddish purple. Inflorescence varies, sometimes a single terminal glomerule of spikelets, 2–several in number, or a sessile glomerule and 2–several others on stalks of unequal length. Foliar bracts subtending the inflorescence 2–5, unequal, the longer usually much surpassing the inflorescence. Spikelets disposed more or less digitately, linear-oblong, mostly 1–2.5 cm long fully developed, florets below maturing, shedding scales and achenes as those on the distal portion develop; axis of spikelet with thickish wings; scales closely ascending-overlapping, folded, in side view ovate, long-acuminate, 3–3.5 mm long, a wide green strongly keeled-winged midportion apically extending as a slightly outwardly curved green point beyond the scarious side of the scale which may be toothed either side of the base of the green tip; green portion of the scale longitudinally wrinkled, the scarious side commonly has two prominent longitudinal whitish nerves, sometimes more, variable even on scales of a single spikelet, often brownish red between the nerves; achene 3-angled, dark brown and shiny at maturity, about 1.5 mm long, obovate in outline, filling the lower half of the scale.

Weedy in moist to wet sands, commonly where soils mechanically disturbed or where compacted with foot or vehicular traffic, occasionally in water standing temporarily, not infrequently on shores exposed in times of low water. Coastal plain and outer piedmont, Del. to s. Fla., w. to Tex., n. in the interior to s.e. Mo.; trop. Am.; Australasia.

5. Abildgaardia

Abildgaardia ovata (Burm. f.) Kral. Fig. 164

Densely caespitose perennial. Stems very slender, filiform, 1–4 dm tall, from small cormlike bases. Leaves all basal, involute, thus very narrow, $\frac{1}{5}$–$\frac{1}{2}$ as tall as the stem at maturity. Inflorescence of 1 or rarely 2 spikelets, the primary one subtended by a single, short, filiform, ciliate-margined, abruptly broad-based bract less than $\frac{1}{2}$ length of spikelet; secondary spikelet, when present, on a slender peduncle from the base of the primary spikelet and longer than it, surrounded at base by a sheathing, bladeless bract, base of spikelet naked. Spikelet 0.8–1.2 cm long, ovoid, pale straw-colored. Fertile scales of spikelet deciduous at maturity from base upward leaving rachilla exposed at

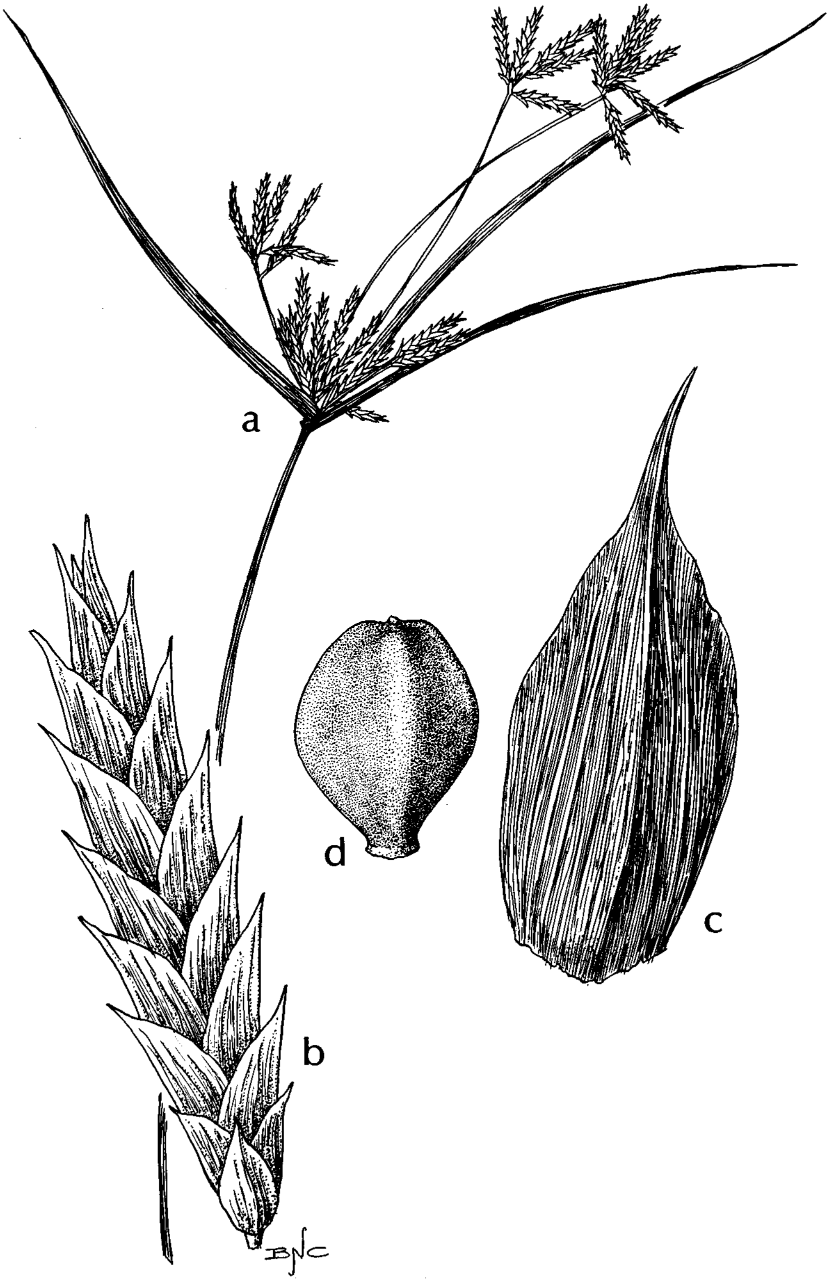

Fig. 163. **Cyperus compressus:** a, inflorescence; b, spikelet; c, scale; d, achene.

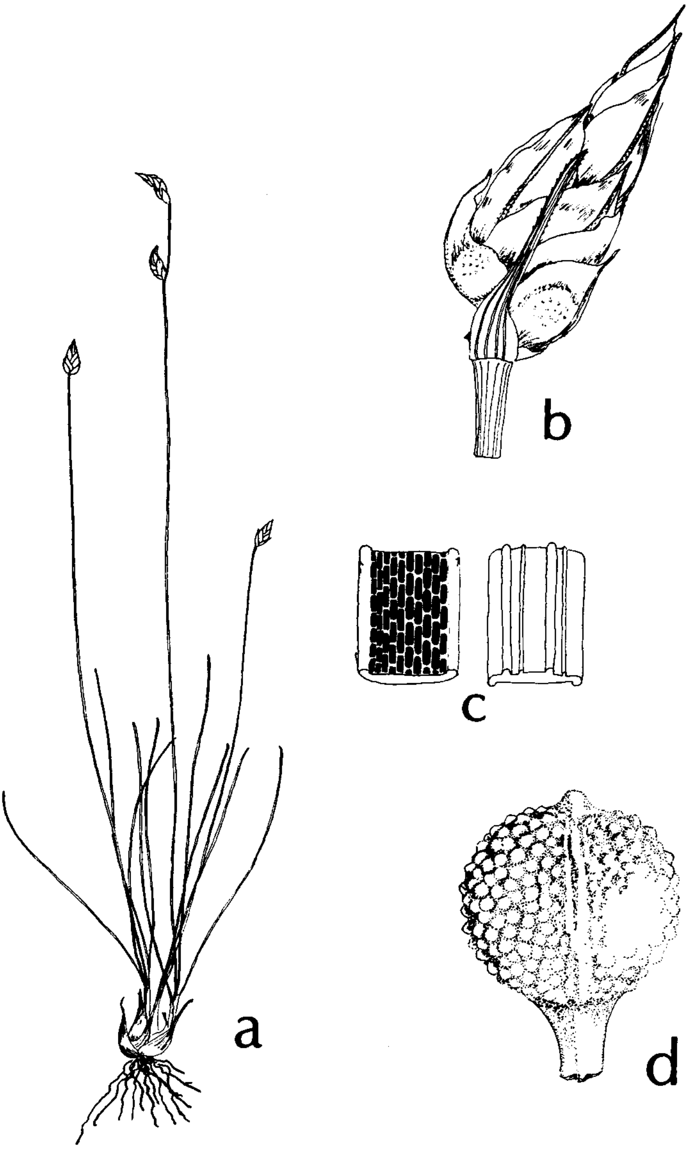

Fig. 164. **Abildgaardia ovata:** a, habit; b, spikelet; c, section of leaf (both sides); d, achene. (From Kral in *Sida* 4: 140. 1971. Fig. 2)

base of spikelet, ovate, with 3–5 brown veins along the slightly keeled center, with broad hyaline margins, minutely mucronulate at apex. Achene about 2 mm long with a very narrow stipelike base, unevenly or obscurely 3-angled though usually subglobose above the stipe, surface pebbled with small tubercles, very minutely apiculate. Perianth bristles none. (*Abildgaardia monostachya* (L.) Vahl)

Moist to wet highly calcareous substrates, especially solution packets in oolite, occasional in savanna over limestone. S. Fla. and the Fla. Keys; Carib. Is., Mex., Old and New World trop.

6. Fimbristylis

Perennial or annual herbs with grasslike leaves near the bases of the stem. Spikelet scales spirally imbricate, the spikelets (in ours) several in a terminal tight cluster, in simple to compound umbelliform cymes, or (in one species) single and terminal (rarely 2–3 separated near the summit of the stem). Flowers bisexual. Perianth none. Stamens 1–3. Style 2–3-branched, the unbranched portion flattened and sometimes fimbriate or papillate for at least a portion of its length, the style base either flat or swollen but not hardening into a tubercle, the style then not persistent.

Treatment adapted from Kral (1971).

Although some species in this genus are (for us) very distinctive and readily conceptualized, others give us much difficulty. In some cases, at least, we seem able, after careful study, to "eyeball-identify" specimens but find it painful to communicate effectively in words what seems clear to the eye. This, of course, is not an uncommon dilemma encountered in other groups as well.

1. Stigmas 3.
  2. Spikelets narrowly linear, lanceolate, or linear-oblong. 1. *F. autumnalis*
  2. Spikelets broadly ovoid to globose or subglobose. 2. *F. miliacea*
1. Stigmas 2.
  3. Inflorescence usually a single terminal spikelet, rarely 2–3 on a stem and not clustered. 3. *F. schoenoides*
  3. Inflorescence of several to many spikelets in terminal tight clusters or umbelliform-cyme systems.
    4. Plants low, to 15 cm tall, usually much less.
      5. Bracts subtending the inflorescence 1–2 cm long, relatively inconspicuous; achene cylindrical (reminiscent of a tiny banana). 4. *F. perpusilla*
      5. Bracts subtending the inflorescence clusters 4–10 cm long, usually as long as the basal leaves, and conspicuous; achene obovate. 5. *F. vahlii*
    4. Plants, (flowering/fruiting stems) usually exceeding 15 cm tall, in some much more.
      6. Spikelets many, conglomerated in very dense terminal headlike inflorescences. 6. *F. spathacea*
      6. Spikelets not as above, the inflorescence much more open.
        7. Plants densely cespitose, the bases deeply set in the substrate. 7. *F. castanea*
        7. Plants not densely cespitose or if so then the bases not deeply set in the substrate.
          8. Plants with rhizomes, either slender and elongate or short and knotty, or with hard bulbous bases.
            9. Bases bearing some slender, scaly rhizomes (if carefully removed from the substrate); ligule of short appressed hairs present. 8. *F. caroliniana*
            9. Bases bulbous and hard, often joined together into a stoutish knotty rhizome; ligule absent. 9. *F. puberula*
          8. Plants not rhizomatous.
            10. Face (one side) of the achene with 15 or more longitudinal rows of shallow pits, the margin all around paler and appearing banded. 10. *F. tomentosa*
            10. Face (one side) of the achene with 12 or less longitudinal rows of horizontally oriented rectangular pits, the margin not paler nor appearing banded.
              11. Perennial. 11. *F. dichotoma*
              11. Annual.
                12. Inflorescences tending to be as broad as long, usually broader, the primary lateral

branches spreading, commonly at right angles to the vertical axis, or even reflexed; a few low warts on the edges of the achene. 12. *F. decipiens*

12. Inflorescences tending to be somewhat longer than broad, the primary branches usually ascending or erect; achene lacking warts or with warts scattered over the whole surface. 13. *F. annua*

1. Fimbristylis autumnalis (L.) R. & S. Fig. 165

Cespitose annual, up to 2 dm tall. Stems flattened. Leaves glabrous, blades linear, to 4 mm broad, margins ciliate-scabrous. Ligule a line of short, pale hairs. Scape edges scabrous. Longest involucral bract with blade similar to leaves, appearing as a continuation of the scape, shorter or longer than inflorescence. Spikelets narrowly linear, linear-oblong or lanceolate, 3–7 mm long, in panicled cymes. Fertile scales ovate-lanceolate, keeled, entire, midrib excurrent as a mucro. Stamens 2, style 3-branched, unbranched portion much longer than the achene. Achene triangular-obovoid, apiculate, surface smooth to verrucose.

Moist to wet sands, peats, silts or clays, commonly on alluvium, primarily on disturbed sites and in open areas. Various provinces, e. N.Am., Carib. Is., Mex., Old and New World Tropics.

2. Fimbristylis miliacea (L.) Vahl. Fig. 166

Cespitose annual, up to 5 dm tall. Stems angled. Leaves glabrous, blades tapering from sheath into blade to slender tip, margins ciliate-scabrous. Ligule not evident. Scapes double-margined along edges. Longest involucral bract shorter than the inflorescence. Spikelets subglobose, ovoid or short cylindrical, 2–4 mm long, in compound cymes. Fertile scales ovate, smooth, apex obtuse. Stamens 1–2, style 3-branched, the unbranched portion about equal to the achene, fimbriate at the summit. Achene obovoid, obscurely trigonous, apiculate, reticulate, the cells narrowly rectangular, horizontally oriented in 4–6 rows on a face, the longitudinal ribs prominent, verrucose-warty.

Sandy peat, peat-mucks, and silts of open areas, savannahs, pond, lake, and river shores, ditches, edges of cultivated areas. Coastal plain, N.C. to Tex.; Carib. Is.; Mex.; C.Am.

3. Fimbristylis schoenoides (Retz.) Vahl. Fig. 167

Cespitose annual, to 3.5 dm tall. Leaves linear, about 1 mm broad, with scabrous margins. Leaf sheaths rounded or subtruncate at junction with blades. Ligule a line of short hairs. Scapes many-ribbed. Longest involucral bract shorter or longer than scape. Spikelets ovoid, acute to blunt tipped, usually solitary, sometimes two or three, separated on the scape. Fertile scales broadly ovate, entire, midrib indistinct except as a short mucro. Stamens 3, style 2-branched, the unbranched portion fimbriate at the summit. Achene lenticular-obovate, reticulate, the depressions arranged in vertical rows.

Moist sands, especially disturbed ground, savannahs, flatwoods, ditch banks. Coastal plain, Ga. to s. Fla., w. into Miss. Introduced from tropical Asia.

4. Fimbristylis perpusilla Harper in Small. Fig. 168

Solitary or tufted annual, to 8 cm tall, usually very much less. Leaves glabrous, ⅓ the length of to equalling the scapes, less than 1 mm broad, linear-filiform. Ligule absent. Scapes wiry, many-ribbed, flattened to subterete. Spikelets ovoid to subglobose, 2–4 mm long, in a simple or compound cymule, the longest bracts exceeding the inflorescence by up to 2 cm. Stamen 1. Styles and stigmas both smooth. Achene unlike that of any other species in our flora and very distinctive; oblong-cylindrical, usually curvate, (reminiscent of a tiny banana), 0.4–0.6 mm long, with about 12 vertical rows of narrowly rectangular horizontally oriented cells, the vertical lines more prominent than the horizontal.

Alluvial borders of pineland ponds. Discovered in 1903 in Sumter Co., Ga., by Roland Harper. Not collected again there or elsewhere until Robert Kral found it in 1962 in Seminole Co., Ga. In 1980 Steven Leonard discovered it in local abundance in a roadside drainage canal near the Waccamaw River, Horry Co., S.C.

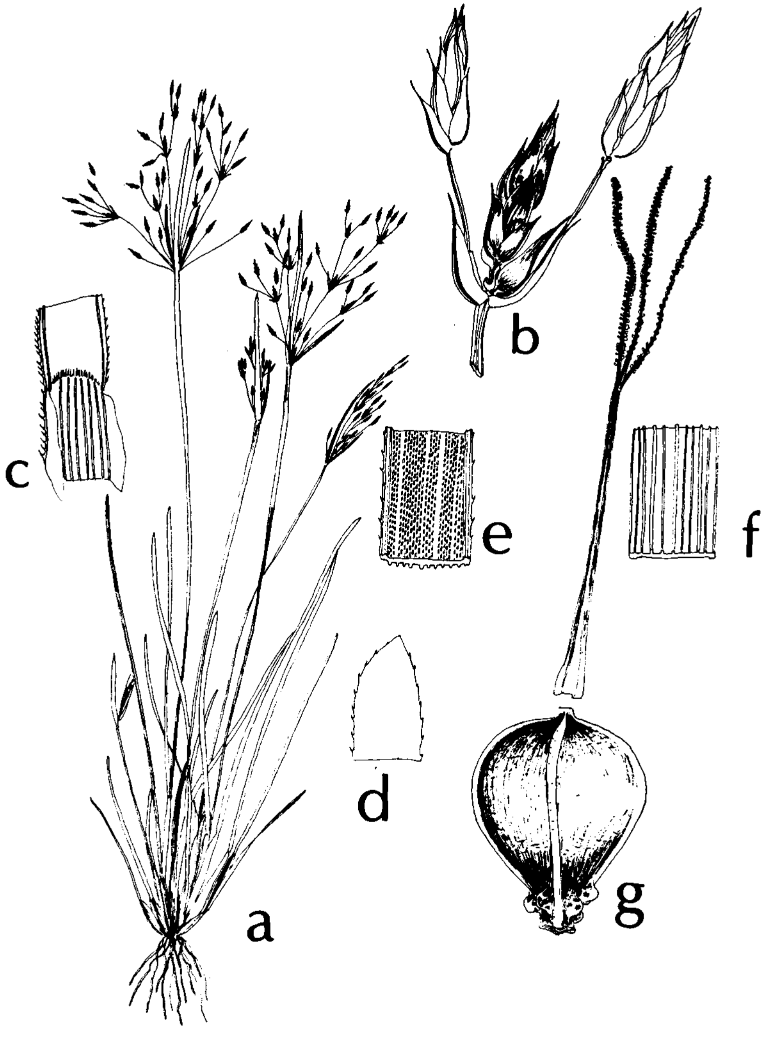

Fig. 165. **Fimbristylis autumnalis:** a, habit; b, spikelets; c, section of leaf at junction of sheath and blade; d, tip of leaf; e–f, section of leaf (both sides); g, achene. (From Kral in *Sida* 4: 166. 1971. Fig. 28)

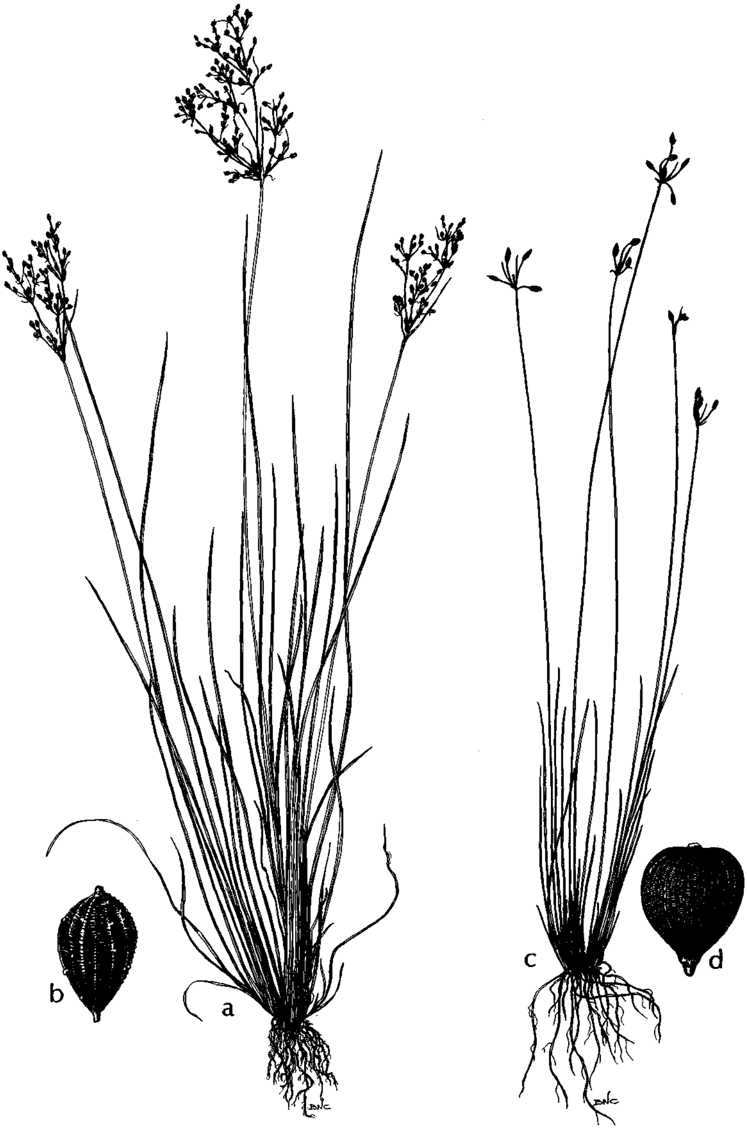
a
b
c
d
BNC
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Fig. 166. a–b, **Fimbristylis miliacea:** a, habit; b, achene; c–d, **Fimbristylis puberula:** c, habit; d, achene.

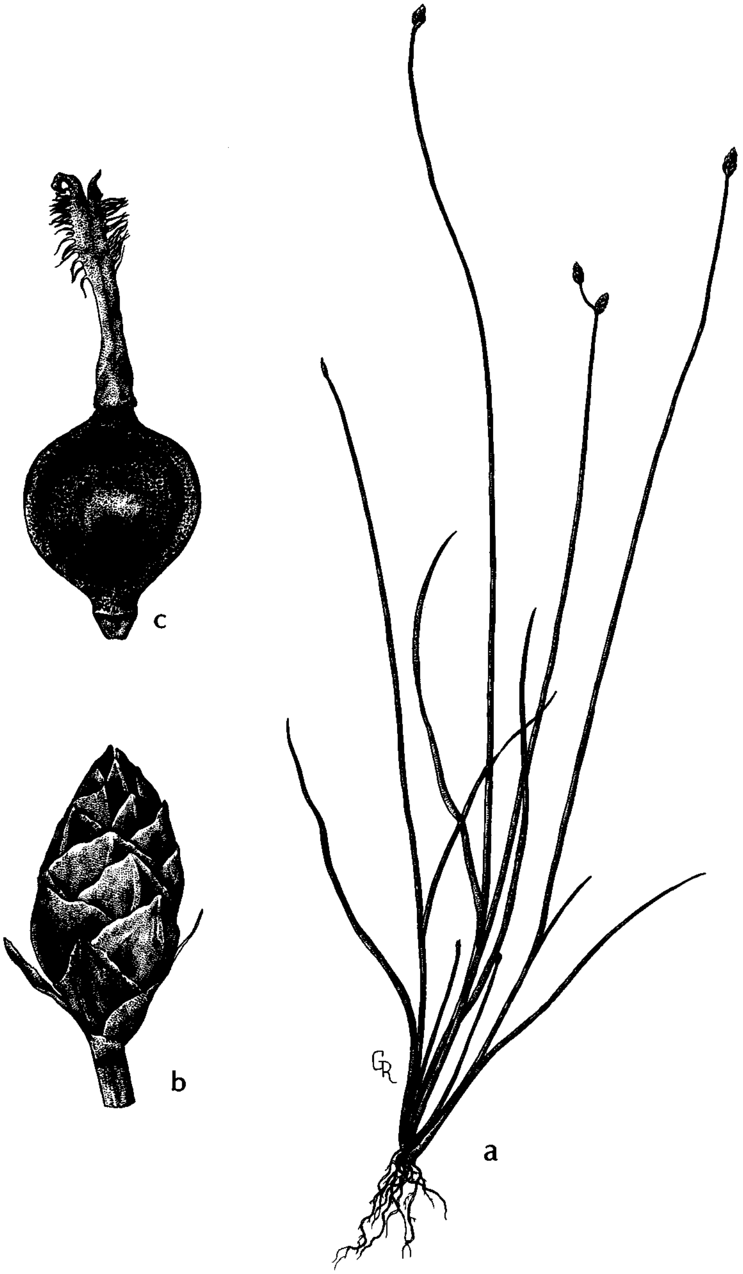

Fig. 167. **Fimbristylis schoenoides:** a, habit; b, spikelet; c, achene.

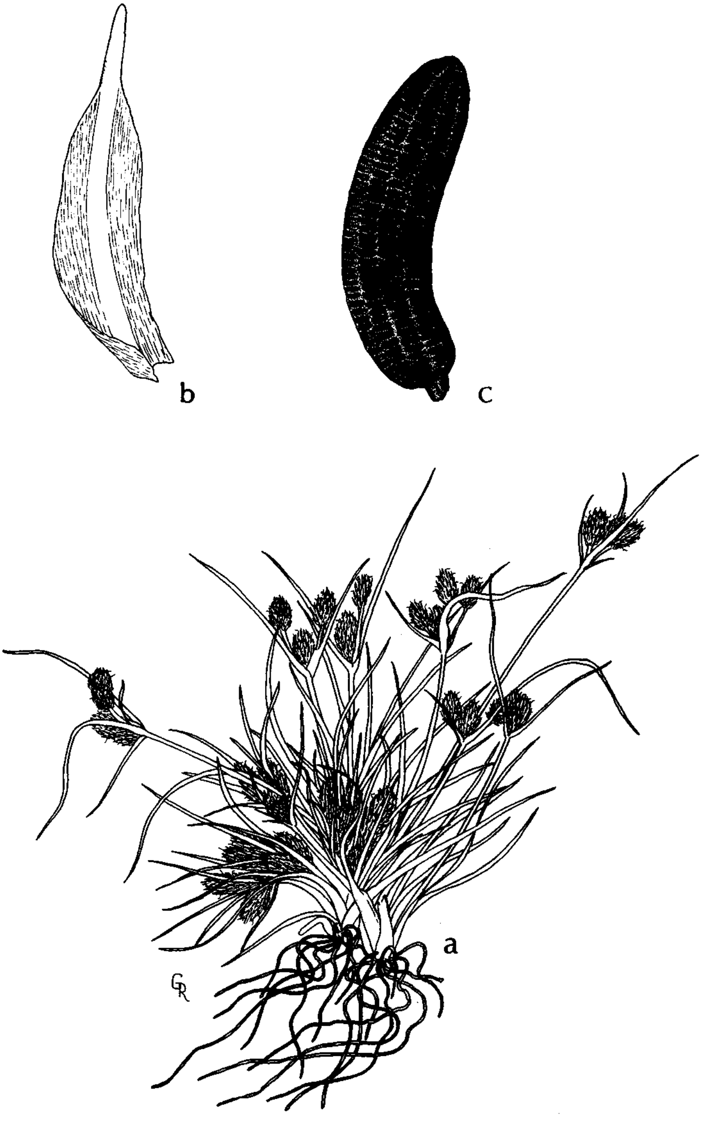

Fig. 168. **Fimbristylis perpusilla:** a, habit; b, scale; c, achene.

5. Fimbristylis vahlii (Lam.) Link. Fig. 169

Cespitose annual, up to 1.5 dm tall, usually much less. Leaves linear-filiform, less than 1 mm broad, sparsely pubescent. Leaf sheaths sparsely pubescent, margins scabrous. Ligule absent. Scapes wiry, many-ribbed, subterete. Longest involucral bract leaflike, very much longer than the inflorescence. Spikelets lance-ovoid, linear-ellipsoidal or oblong, 5–10 mm long, acute, 3–8 in a dense terminal cluster subtended by several leaflike involucral bracts. Fertile scales ovate-lanceolate or oblong-lanceolate, glabrous, midrib exserted as a mucro. Stamen 1, style 2-branched, base swollen, surface smooth or papillate from about the midpoint upwards. Achene obovate, individual rectangular cells arranged horizontally in 5–7 vertical rows on a side.

On fine sands, silts or clays, usually alluvial on shoreline, edges of ponds, lakes, often in disturbed bottomlands. S.C. to n. Fla., w. to Tex., Ky., Ill., Mo., Ark., O., Kans., Calif., Ariz.; Mex., C.Am.

6. Fimbristylis spathacea Roth. Fig. 170

Solitary or tufted perennial to 5 dm tall, glabrous. Leaves linear, 1–4 mm broad, flat to revolute, stiffly spreading, about half as long as the scapes, margins scabrous. Leaf sheaths with margins abruptly converging to the blade. Ligule absent. Scapes stiff, subterete, with several prominent ridges. Longest involucral leaf usually shorter than the inflorescence. Spikelets ovoid, 2–5 mm long, acute to blunt, many in dense or congested head-like cymes. Fertile scales ovate, slightly keeled, entire, obtuse to emarginate, with broad scarious margin, midrib not excurrent. Stamen 1, style 2-branched, the branches papillate. Achene obovate, about 1 mm long, sometimes obscurely 3-angled in cross-section, distinctly or indistinctly reticulate, often verrucose, brown to almost black.

Coastal dunes, beaches, edges of brackish marshes, marly spoil banks. Often very abundant in areas of disturbance. Presumably introduced. Peninsular Fla. and the Keys. In Old and New World tropics.

7. Fimbristylis castanea (Michx.) Vahl. Fig. 171

Densely cespitose perennial, the bases deeply set in the substrate, up to 1.5 m tall. Leaves linear, usually involute, margins ciliate-scabrous. Leaf sheaths thick and rigid, truncate or rounded, bases of leaves hard, leathery, dark brown and ciliate at apex. Ligule absent or incomplete. Scapes slender, wandlike, many-ribbed, as wide as or wider than the leaf blades. Longest involucral bract equal to or shorter than the inflorescence. Spikelets 5–15 mm long, ovoid or lance-ovoid, rarely cylindrical, in compound umbellate cymes. Fertile scales ovate, glabrous or erose in age, the apex rounded, midrib excurrent as a mucro. Stamens 2–3, style 2-branched, fimbriate from base to the point of branching. Achene lenticular-obovate or obpyriform, reticulate, the individual depressions isodiametric or horizontally rectangular, usually arranged in fine vertical lines.

Moist sands, muck or marl, brackish coastal marshes, duneswales. L.I. to Fla. Keys, w. along Gulf Coast s. and w. to Mex.; Bah. Is., Cuba.

8. Fimbristylis caroliniana (Lam.) Fern. Fig. 172

Rhizomatous perennial up to 1.5 m tall. Stems solitary or in small tufts, the bases shallowly set in the substrate. Leaves glabrous or pubescent near the ligule, 0.2–5 mm broad, linear, margins scabrous. Leaf sheaths glabrous to pubescent. Ligule of appressed hairs. Scapes about the width of the leaf blade, glabrous, many ribbed. Longest involucral bract much shorter than to slightly longer than the inflorescence. Spikelets ellipsoid, lance-ovoid or oblong, 0.5–1.5 cm long, blunt to acute, in compound umbellate cymes. Fertile scales ovate, glabrous or pubescent, sometimes with short mucro. Stamens 3, style 2-branched, fimbriate below the point of branching. Achene lenticular-obovate, about 1 mm long, finely reticulate, the cells rectangular and horizontally oriented and forming vertical lines.

Brackish, alkaline, mildly acid to sandy peats, beaches, duneswales, lakeshores, roadside ditches, savannahs, flatwoods. Coastal plain, N.J. to Fla. Keys, w. in Gulf states to Tex.; Mex.; Cuba.

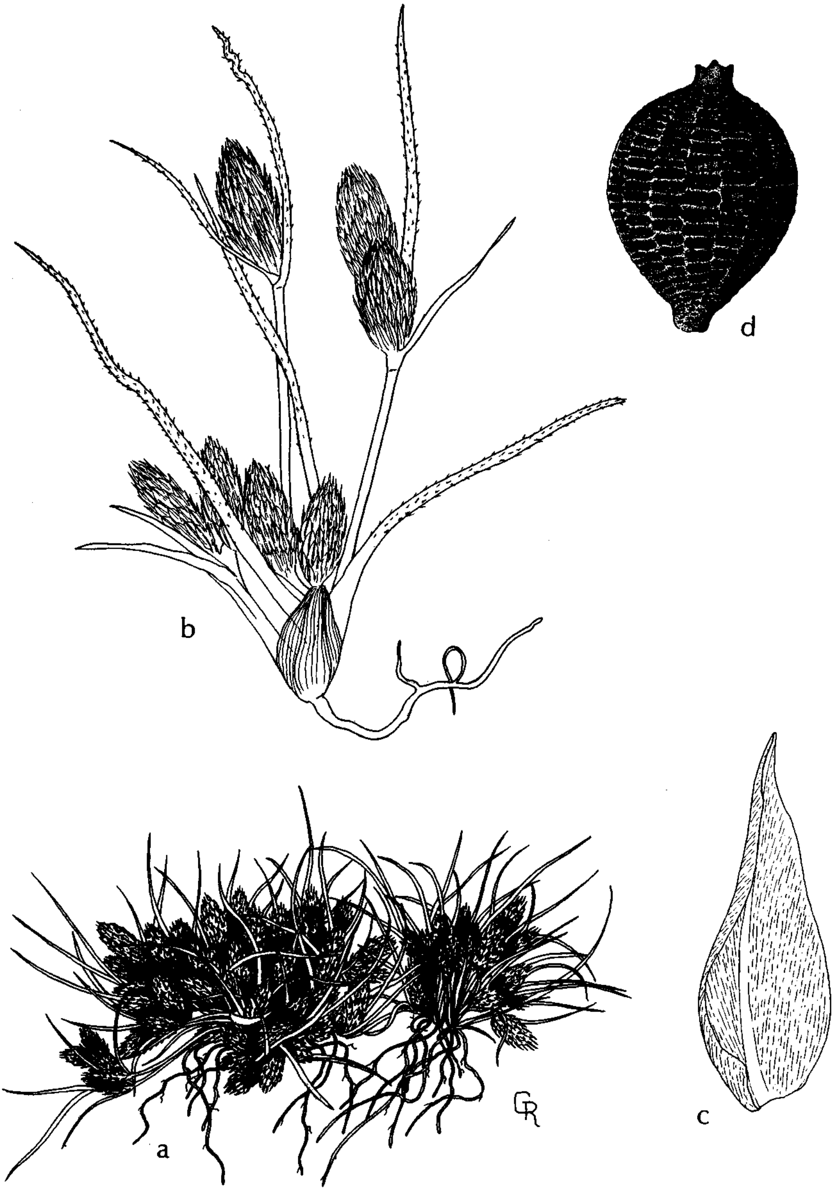

Fig. 169. **Fimbristylis vahlii:** a, habit; b, habit, enlarged; c, scale; d, achene.

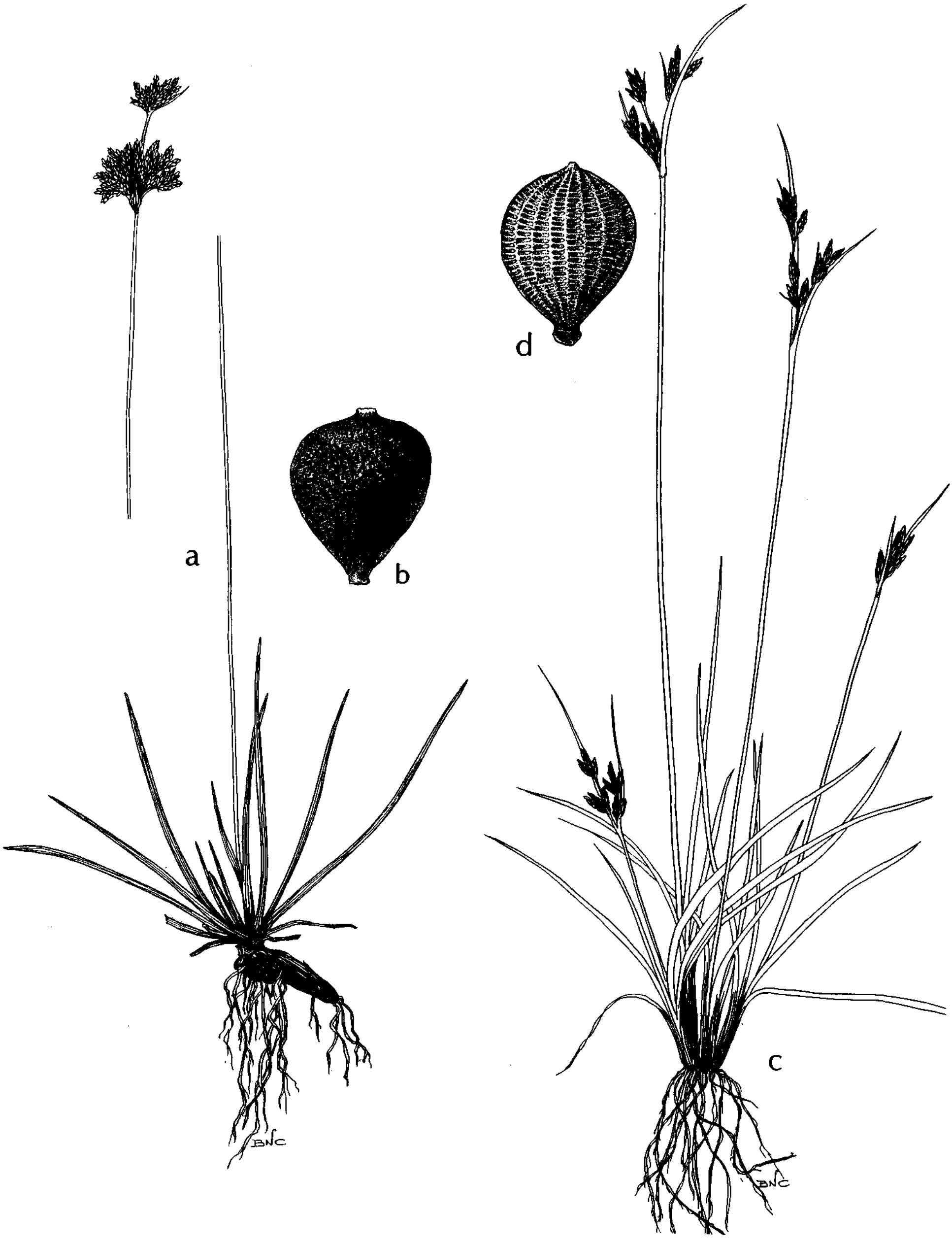
a
b
c
d
BNC
BNC

Fig. 170. a–b, **Fimbristylis spathacea:** a, habit; b, achene; c–d, **Fimbristylis dichotoma:** c, habit; d, achene.

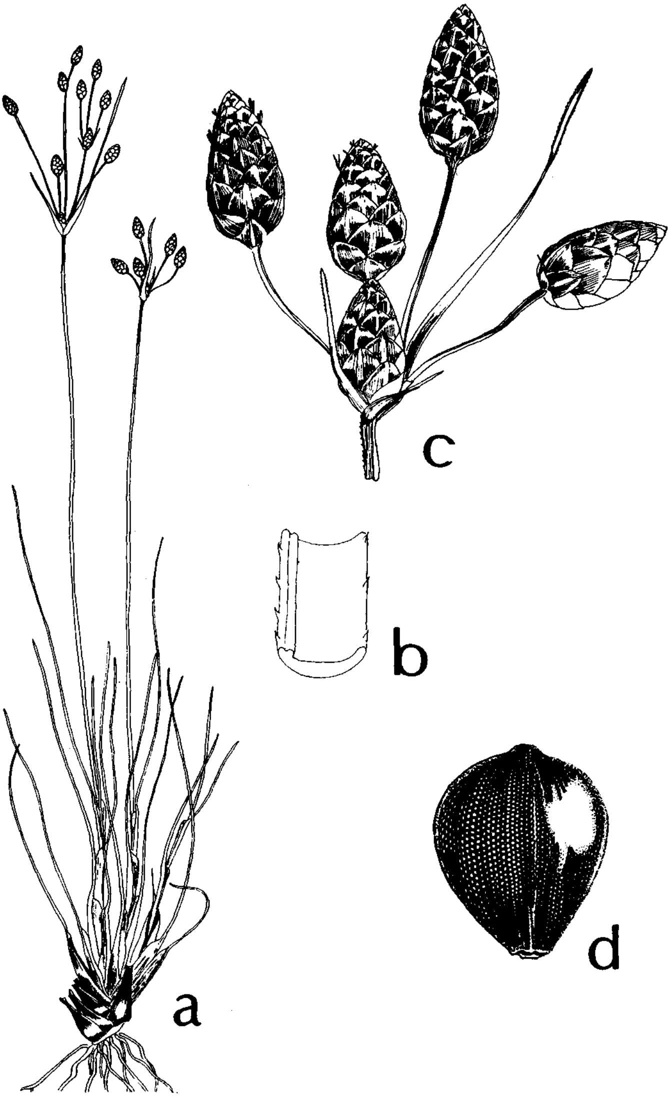

Fig. 171. **Fimbristylis castanea:** a, habit; b, section of a leaf; c, inflorescence; d, achene. (From Kral in *Sida* 4: 195. 1971. Fig. 48)

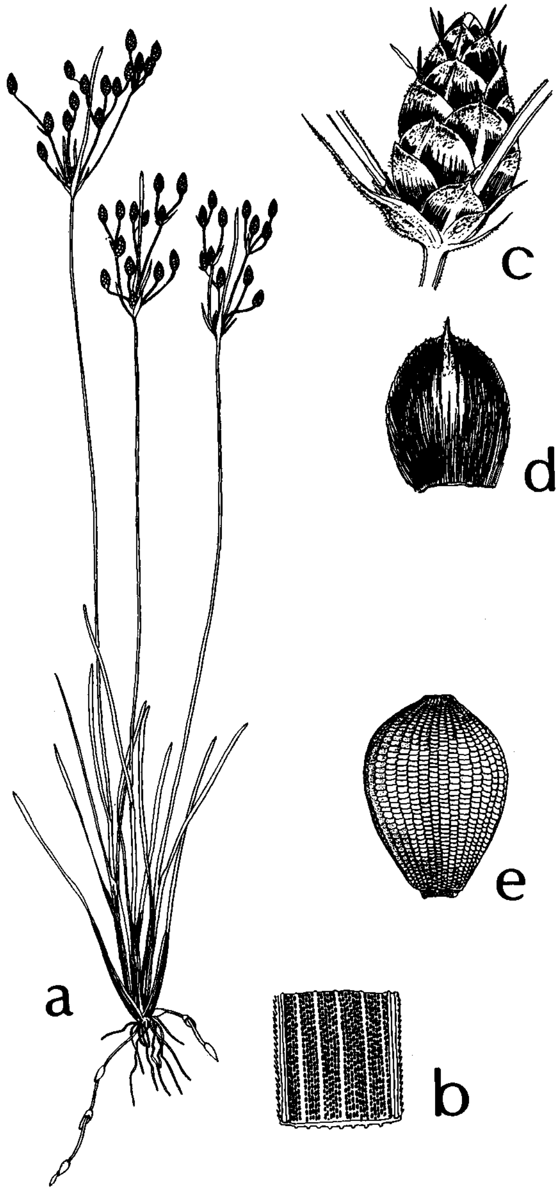

Fig. 172. **Fimbristylis caroliniana:** a, habit; b, section of leaf; c, spikelet; d, scale; e, achene. (From Kral in *Sida* 4: 171. 1971. Fig. 32)

9. Fimbristylis puberula (Michx.) Vahl. Fig. 166

Tufted perennial, solitary or in small tufts, up to 1 m tall, stem bases often hard, knotty, joined together into short, thick rhizomes. (A few coastal Ga. and Fla. populations with slender, pale, rhizomes). Leaves linear, about 1 mm broad, glabrous to pubescent, margins ciliate-scabrous. Leaf sheaths hard, thick, fibrous, long ciliate at apex. Ligule absent or incomplete. Longest involucral bract shorter than the inflorescence or rarely equalling it. Spikelets lance-ovoid to ovoid or ellipsoid, usually few flowered, in compact or open umbellike cymes or a simple umbellike cyme. Fertile scales ovate, obovate or reniform, backs rounded, margins scarious, ciliate, midrib excurrent as a mucro, lower scales pubescent. Stamens 3. Style 2-branched, unbranched portion fimbriate from about the mid-point to the base of branches. Achene lenticular-obovate, about 1 mm long, flat to tumid or umbonate, reticulate, cells rectangular (infrequently isodiametric), arranged in longitudinal lines 11–20 on a face. (*F. puberula* var. *drummondii* (Torr. & Hook.) Ward)

Savannas, pinelands, edges of bogs, meadows, prairies. Coastal plain, L.I., s. into pen. Fla., w. to Tex., Okla., Kans., Nebr., s.w. to Ariz; cen. piedmont to its s.w. edge; Gr. Lakes Lowlands.

10. Fimbristylis tomentosa Vahl. Fig. 173

Cespitose annual to 7.5 dm tall. Leaves pubescent, linear, 2–4 mm broad, margins ciliate-scabrous. Leaf sheaths pubescent with wide, brownish, subscarious margin, this long-ciliate and truncate above juncture with blade. Ligule present as a line of short hairs. Scapes smooth or pubescent. Longest involucral bract exceeding inflorescence, leaflike, with a prominently pubescent sheath. Fertile scales ovate, glabrous at maturity. Spikelets lance-ovoid, acute, usually many in a branched cyme. Fertile scales ovate, glabrous, midrib exserted as a short mucro. Stamens 2, style 2-branched, the unbranched portion fimbriate. Achene obovoid, slightly apiculate, lenticular, finely pitted, the pits in vertical rows, the margins paler and appearing banded.

Moist to wet sands, silts or clays of disturbed ground, edges of ponds, rivers, ditches, canals, cultivated grounds. Coastal plain, N.C. to n. Fla., w. to Tex.

11. Fimbristylis dichotoma (L.) Vahl. Fig. 170

Tufted perennial, up to 8 dm tall. Leaves often glaucous, linear, 2–5 mm broad, usually glabrous on lower surface, rarely pubescent, margins pale-cartilaginous, ciliate-scabrous. Leaf sheaths broad, appressed, pubescent, with a wide, tan or reddish brown, subscarious margin that is ciliate and subtruncate apically. Ligule a line of short hairs. Scapes flattened or oval in cross-section. Longest involucral bract usually longer than the inflorescence, the blade leaflike, its sheath sometimes pubescent and ciliate. Spikelets 4–8 mm long, lance-ovoid or oblong, acute, in simple or compound umbellate cymes. Fertile scales oblong or ovate, apex acute or obtuse, midrib exserted as a short mucro. Stamens 1–2, style 2-branched, fimbriate below the point of branching. Achene about 1 mm long, lenticular-obovate, apiculate, striate-reticulate, with rectangular cells horizontally arranged in (5–) 10–12 longitudinal rows per side, the longitudinal ribs more conspicuous than the horizontal. (F. *annua* var. *diphylla* (Retz.) Kükenth., *F. diphylla* ssp. *diffusa* Ward)

Moist open substrates, weedy. Savannahs, fields, grasslands, roadsides. Coastal plain, Va. to Tex. Introduced. Warm temperate to tropical areas of both hemispheres.

12. Fimbristylis decipiens Kral. Fig. 174

Similar to *F. annua.* Kral (loc. cit.) discusses at some length the problem of distinguishing between *F. decipiens, F. annua,* and *F. dichotoma,* all of which sometimes grow intermixed, the morphology of *F. decipiens* being intermediate between *F. dichotoma* and *F. annua.* He states that processed specimens are (for him) difficult to distinguish yet in the field he can do so readily. Rather than set down here a description of *F. decipiens,* we offer the following quotation from Kral:

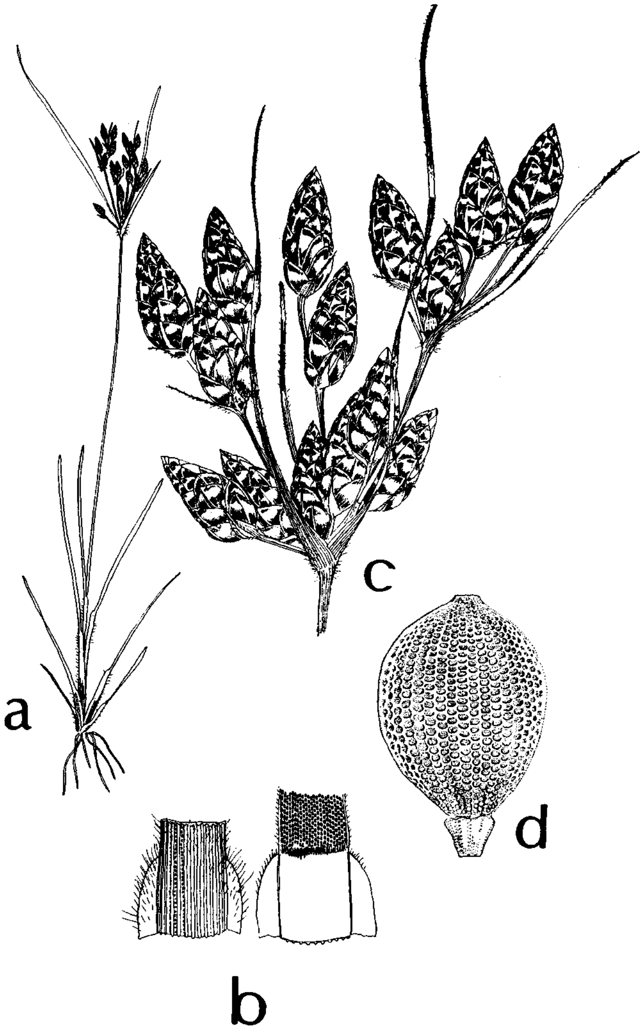

Fig. 173. **Fimbristylis tomentosa:** a, habit; b, summit of leaf sheath (two views); c, inflorescence; d, achene. (From Kral in *Sida* 4: 177. 1971. Fig. 36)

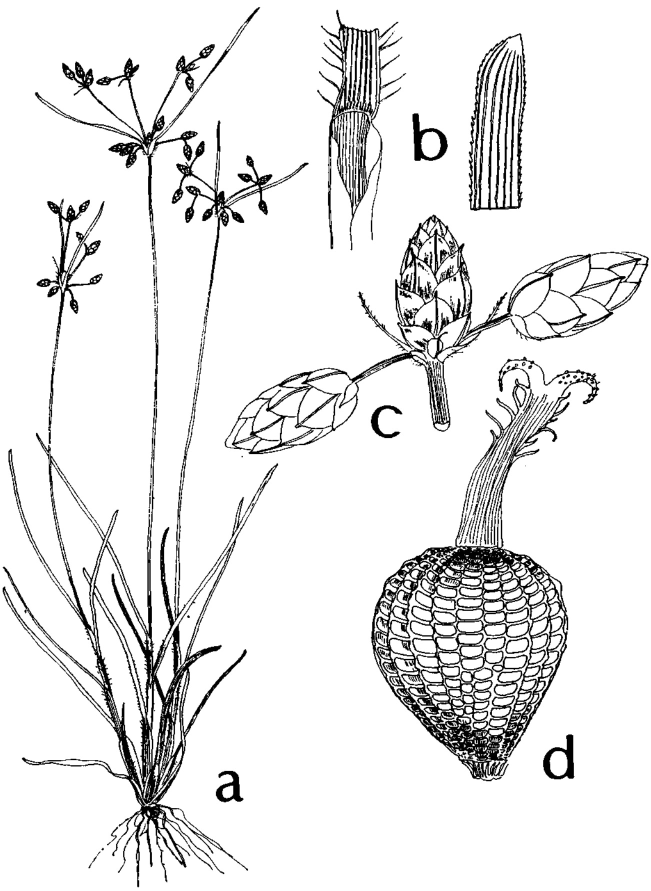

Fig. 174. **Fimbristylis decipiens:** a, habit; b, ligule (left), leaf tip (right); c, spikelets; d, achene. (From Kral in *Sida* 4: 180. 1971. Fig. 38)

It may be distinguished from *F. annua* by its harder, broader and more spreading leaves, its more rigid scapes, and by the almost umbonate appearance of the akene. It may be quickly distinguished from *F. dichotoma* on the basis of its usually fewer-flowered and broader inflorescences, the primary rays of which are spreading, often reflexed, and by the different character of pubescence of its leaf and sheath margins. While tubercles do form on the akene, they are usually larger and fewer than those forming on verrucose examples of *F. annua* and they are only to be found distally along the swollen edges of the fruit.

Moist sandy roadbanks, fields, and disturbed, open usually piney woods, weedy. Coastal plain, e. N.C. to n. Fla., w. to e. Tex.

13. **Fimbristylis annua** (All.) R. & S. Fig. 175

Caespitose annual, decumbent or erect, up to 5 dm tall. Leaves glabrous to tomentose, narrowly linear, 1–2 mm broad, margins often pale-cartilaginous, usually ciliate-scabrous. Leaf sheaths broad, glabrous or pubescent, with a wide subscarious margin, this ciliate toward its apex, truncate or acute. Ligule a line of short hairs. Scapes ascending or erect. Longest involucral bract similar to leaves, longer or shorter than inflorescence, sheathing base glabrous or pubescent. Spikelets 3–8 mm long, lance-ovoid or oblong, acute, in simple or compound umbellate cymes. Fertile scales broadly oblong to ovate, apex acute or obtuse, glabrous, midrib not usually exserted. Stamens 1–2, style 2-branched, the unbranched portion fimbriate throughout or smooth at base. Achene lenticular, obovate, apiculate, striate-reticulate, the cells rectangular, horizontally arranged in 5–12 longitudinal rows per side, longitudinal ribs more conspicuous than the horizontal. Achene surface sometimes verrucose, with warts along the longitudinal ribs or over entire cells, or without warts. (*F. baldwiniana* (Schult.) Torr.)

Various moist open substrates, weedy. Savannas, grasslands, disturbed or cultivated areas, roadsides. Coastal Plain, Fla. to Tex., Ariz., n. to Pa., Ill., Mo., Okla. Introduced. Euras.

7. Bulbostylis

Annuals or perennials, in tufts from which arise numerous to many wiry flowering-fruiting stems, these rigid or lax. Leaves basal, filiform to narrowly linear, usually harsh to touch, sheaths overlapping and ciliate or fimbriate apically. Inflorescences subtended by 1–several unequal leaflike bracts, the spikelets solitary (rarely), in simple to compound umbels (though with one or more spikelets often sessile) or in capitate clusters, ovoid, several-flowered. Fertile scales keeled, spirally imbricate. Flowers bisexual. Perianth bristles lacking. Style 1, stigmas 3; style base enlarged and persistent on the 3-angled achene as a tubercle, this minute and dunce-cap-like.

Each of the several species of *Bulbostylis* in our range may occur on well-drained usually sandy sites, places which may be very dry, especially during drought periods. All, however, are colonizers and may, even two or three kinds together, occupy various kinds of open habitats, often moist to wet alluvial sands or other wet sites. For that reason we include all species in our range.

1. Inflorescence usually with at least some spikelets or groups of spikelets on thin, longish wiry stalks, thus essentially umbellike, very rarely the spikelets subsessile and in subcapitate clusters and then only a few spikelets per stem.
   2. Spikelet scales truncate at the apex, mostly notched, the tip of the keel scarcely or only reaching the base of the notch; surface of achene very finely transversely latticed. 1. *B. capillaris*
   2. Spikelet scales broadly obtuse, the tip of the keel reaching the tip of the scale or slightly exceeding it; achenes with a grayish very fine waxy pebbling which is easily sloughed. 2. *B. ciliatifolia*
1. Inflorescence with spikelets in capitate clusters, even if some with short stalks, the cluster not open and umbellike.

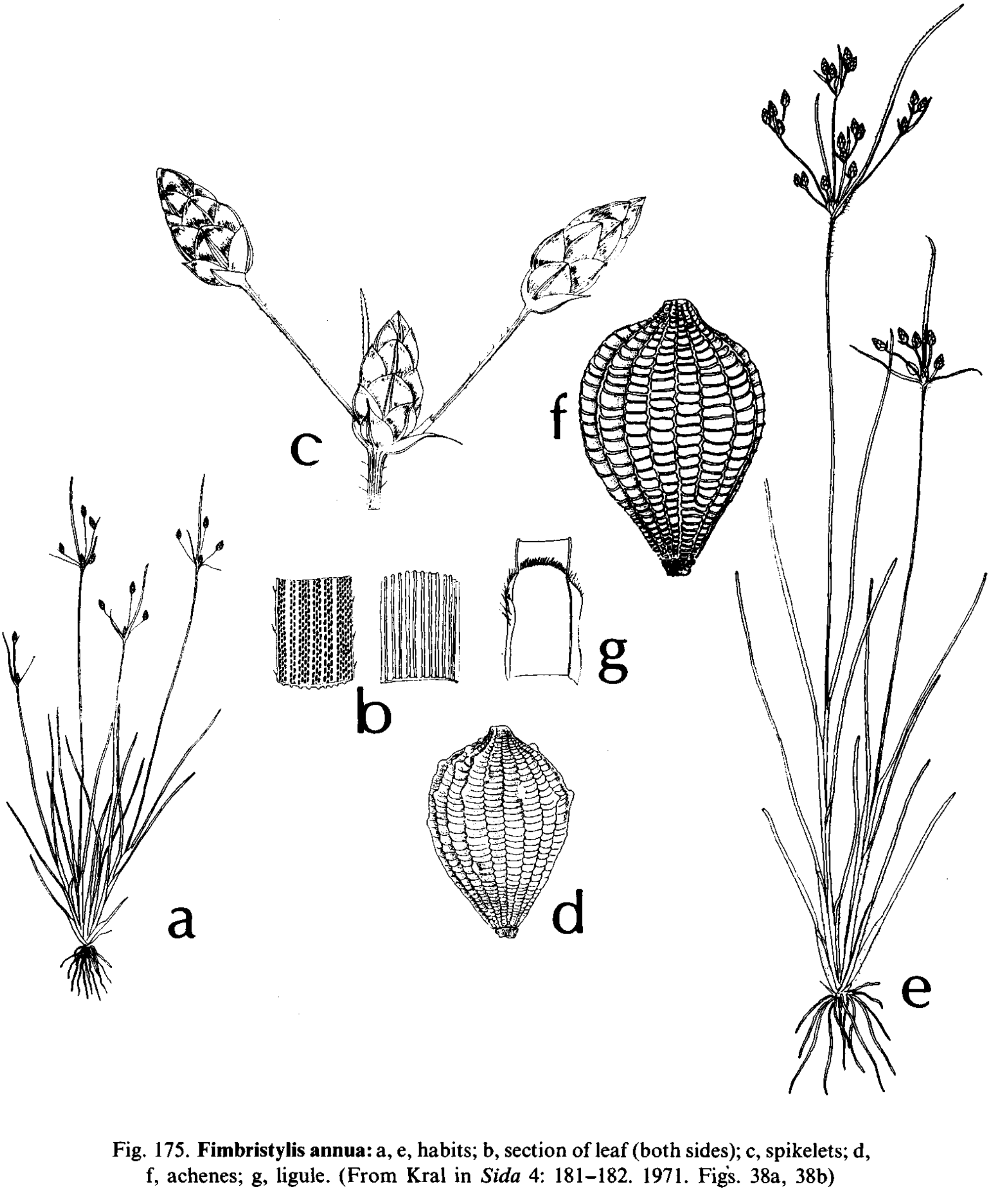

Fig. 175. **Fimbristylis annua:** a, e, habits; b, section of leaf (both sides); c, spikelets; d, f, achenes; g, ligule. (From Kral in *Sida* 4: 181–182. 1971. Figs. 38a, 38b)

3. Base of the inflorescence bract abruptly very much broadened on each side, this prominently long-fimbriate-pectinate on its margins. 3. *B. warei*

3. Bases of the inflorescence bracts with membranous winglike margins having rounded or narrowed shoulders, its edges smooth or ciliate.

  4. Inflorescence bracts numerous, conspicuous, the longest very much exceeding the spikelet cluster. 4. *B. stenophylla*

  4. Inflorescence bracts few, inconspicuous, the longest mostly not exceeding the spikelet cluster, or only one about twice as long. 5. *B. barbata*

1. **Bulbostylis capillaris** (L.) Clarke in Hook. f. Fig. 176

Annual. Stems to 3 dm tall. Leaf blades linear-filiform, 0.5 mm wide or less, smooth, the edges rolled downward, rough-pubescent, papillose or smooth; leaf sheaths fimbriate apically. Inflorescence commonly umbellike, the bracts short and inconspicuous, or 1–2, filiform and 2–3 times exceeding the inflorescence; occasional plants have but a few subsessile spikelets, thus the inflorescence not open. Spikelet scales truncate, usually notched. Achene 3-angled, obovoid, about 1 mm long, its surface very finely transversely latticed. (*Stenophyllus capillaris* (L.) Britt.)

Commonly in sandy, silty or clayey places, fallow fields, roadsides, cut over lands; solution pockets on rock outcrops, railroad gravels. Maine to Minn., generally southward to Fla. and Tex., thence to Calif. and Oreg.; Mex., C.Am., Cuba; s. Asia.

2. **Bulbostylis ciliatifolia** (Ell.) Fern. Fig. 177

Annual or perennial. Stems to 4 dm tall. Leaves ¼–½ the length of the mature culms; blades linear-filiform, the margins rolled under, pubescent; leaf sheaths pubescent and fimbriate apically. Spikelets few-flowered, in an open, umbellate cyme, or a compound system. Lowest involucral bract usually shorter than the inflorescence. Spikelet scales broadly obtuse, midrib prominent, often green, extending to or beyond the scale tip. Achene 3-angled, obovoid, slightly less than 1 mm long, the surface with a grayish very fine waxy pebbling. This species has two recognized varieties:

- Annual, the inflorescence a simple to rarely compound umbel whose longest bract seldom exceeds the inflorescence, the edges of the leaves with fine short stiff hairs. var. *ciliatifolia* (*Stenophyllus ciliatifolia* (Ell.) Mohr)
- Perennial (annual northward), the inflorescence usually of many spikelets in a compound umbel, the longest bract commonly longer than the inflorescence, the edges of the leaves tuberculate-scabrid. var. *coarctata* (Ell.) Kral (*Stenophyllus coarctatus* (Ell.) Britt. in Small; *S. carteri* Britt. in Small)

Both varieties occur in the coastal plain from s.e. Va. to Fla., thence to Tex.; Cuba. The former in moist to wet sands and peaty-sands of savannas, pine flatwoods, especially on exposed substrates of clearings, fallow fields, roadsides. The latter is more nearly restricted to the deeper well-drained sands of longleaf pine, scrub-oak ridges and hills though it may be weedy in disturbed places, even in moist to wet soils of borrow pits within that vegetational type.

3. **Bulbostylis warei** (Torr.) Clarke. Fig. 178

Perennial. Leaves ¼–½ the length of the stems, the blades narrowly linear, to 0.7 mm wide, flat or the edges slightly rolled, the margins and veins smooth or more rarely roughish-pubescent; leaf sheath long-fimbriate at the summit. Spikelets in a dense headlike cluster, the longest inflorescence bracts usually exceeding the spikelet cluster, their bases distinctively abruptly broadened and fimbriate-pectinate. Achene 3-angled or 3-lobed, obovoid, slightly over 1 mm long, usually white and enamellike, the surface irregularly transversely ridged or knobby; at the apex, lobes of the achene surpassing the tubercle which thus is seated in a pit. (*Stenophyllus warei* (Torr.) Britt.)

Longleaf and sand pine, scrub oak hills and ridges, often abundant in places of soil disturbance, very rarely in temporarily wet sands. Coastal plain, s.e. N.C. to s. Fla. and throughout Fla. Panhandle.

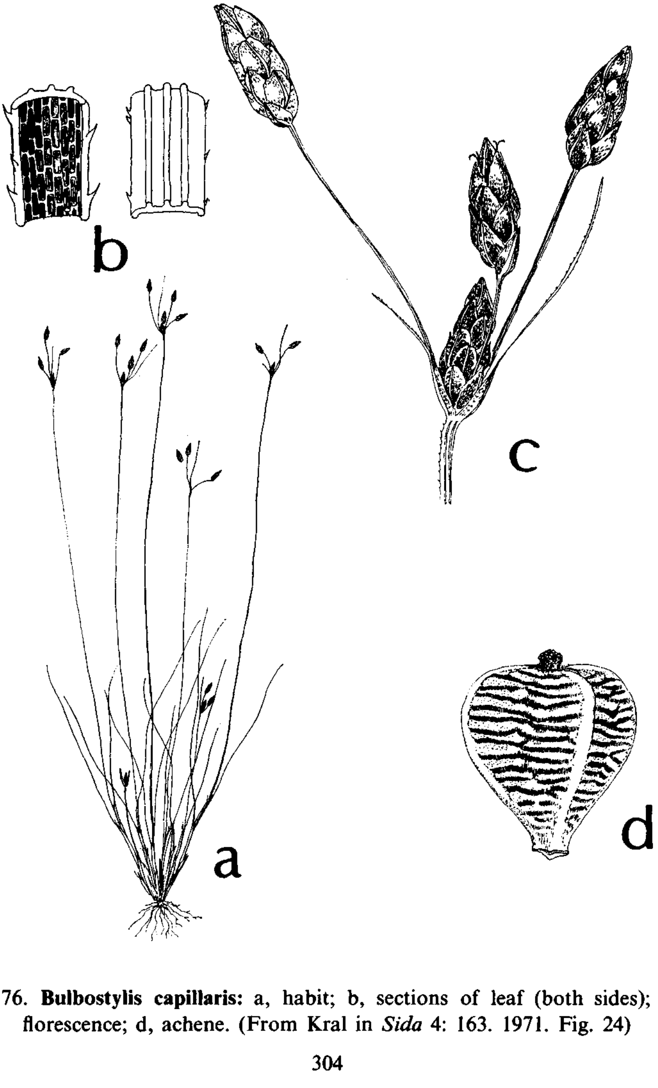

Fig. 176. **Bulbostylis capillaris:** a, habit; b, sections of leaf (both sides); c, inflorescence; d, achene. (From Kral in *Sida* 4: 163. 1971. Fig. 24)

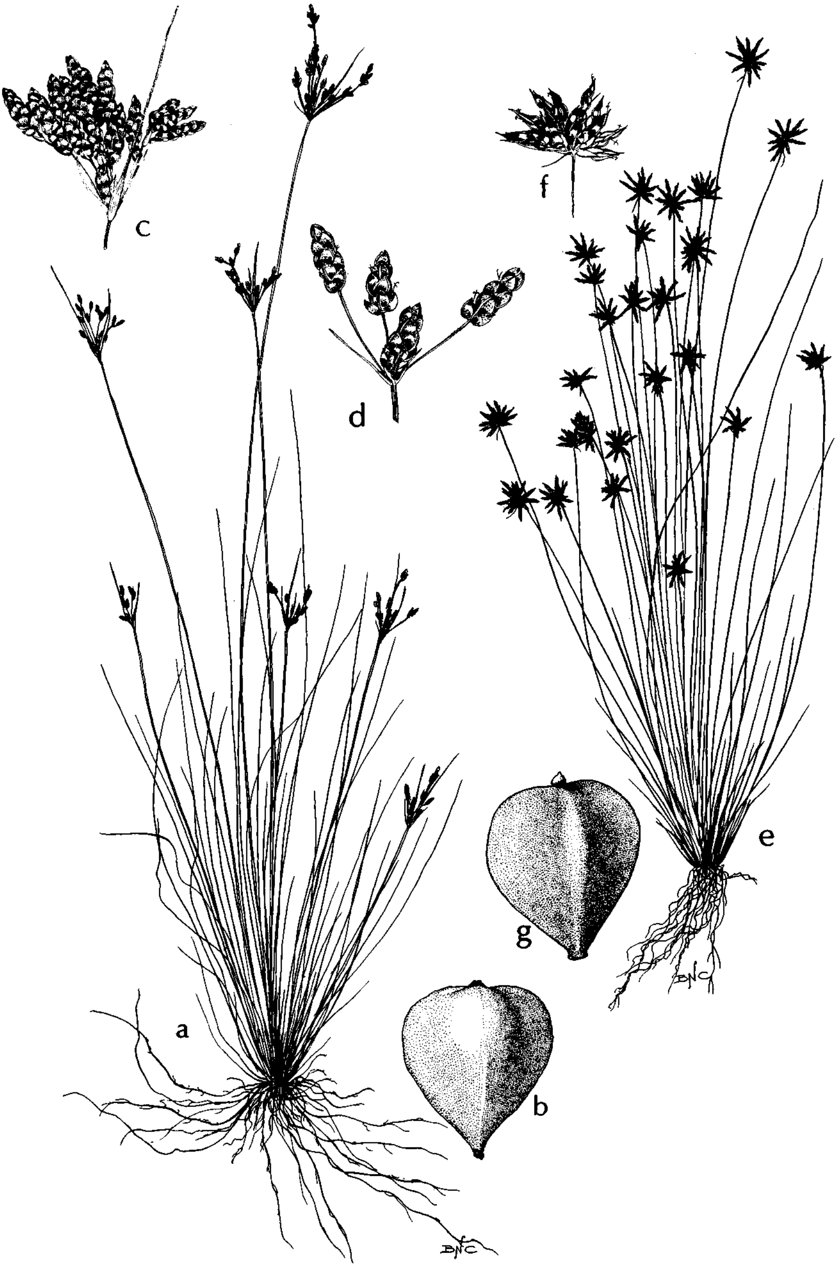

Fig. 177. a–c, **Bulbostylis ciliatifolia** *var.* **coarctata:** a, habit; b, achene; c, inflorescence; d, **Bulbostylis ciliatifolia** *var.* **ciliatifolia:** inflorescence; e–g, **Bulbostylis barbata:** e, habit; f, inflorescence; g, achene. (c, d, f, from Kral in *Sida* 4. 1971)

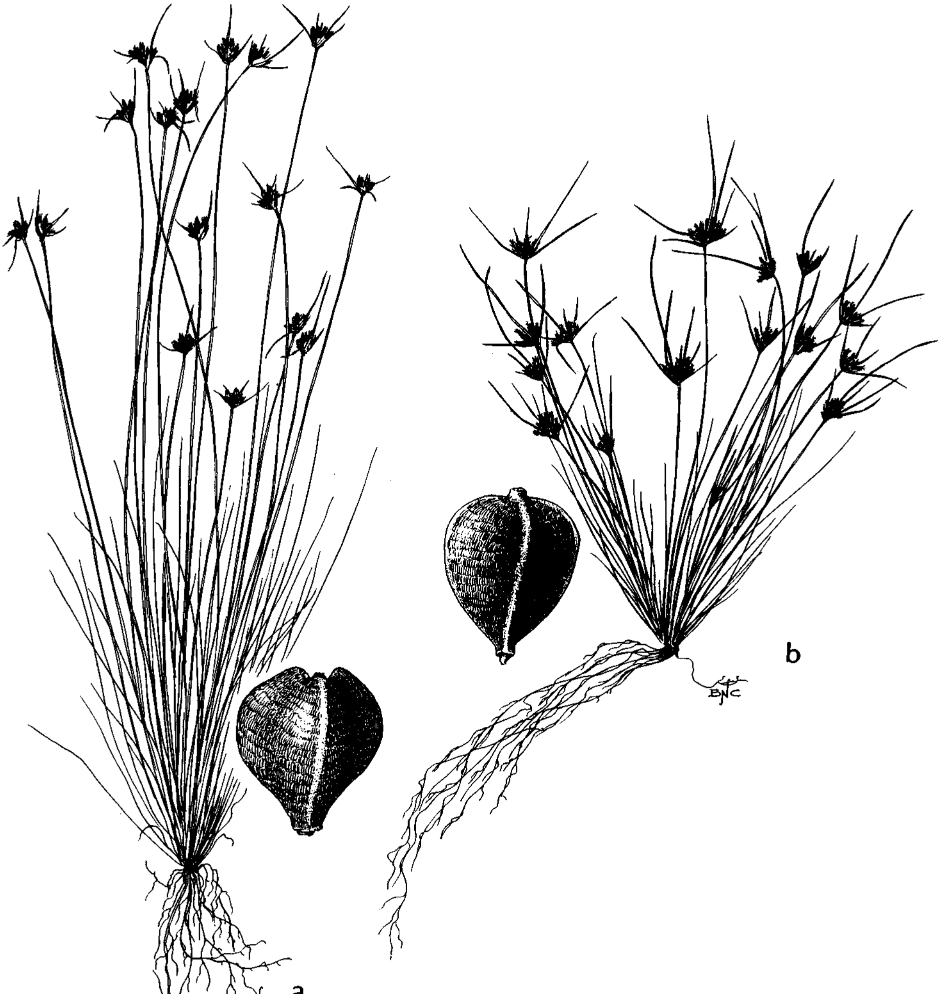

Fig. 178. a, **Bulbostylis warei:** habit and achene; b, **Bulbostylis stenophylla:** habit and achene.

4. Bulbostylis stenophylla (Ell.) Clarke. Fig. 178

Annual, stems to 2 dm tall. Leaves $^{1}/_{3}$–$^{2}/_{3}$ the length of the mature stems; blades linear-filiform, flat or rolled on the edges, veins and the lower surface and leaf sheaths pubescent, the summits of the sheaths long-fimbriate. Spikelets in dense terminal, conspicuously bracteate clusters. Longest involucral bracts much exceeding the inflorescence, setaceous-tipped. Scales ovate, acute, pubescent, greenish brown, the midrib excurrent as a short mucro. Achene sharply 3-angled, obovoid, about 1 mm long, grayish, surface transversely ridged-latticed. (*Stenophyllus stenophyllus* (Ell.) Britt.)

Sandy fields, roadsides, clearings in pine flatwoods. Coastal plain, N.C. to s. Fla., w. through the Fla. Panhandle; Cuba.

5. Bulbostylis barbata (Rottb.) Clarke in Hook. Fig. 177

Annual, stems to 3 dm tall, usually not exceeding 2 dm. Leaves $^{1}/_{4}$–$^{2}/_{3}$ the length of the mature stems; blades filiform, the edges rolled, the margins and sometimes the veins pubescent; leaf sheaths smooth on the margins, fimbriate at their summits. Spikelets usually in capitate clusters, the longest bracts rarely exceeding the inflorescence. Scales lance-ovate, acute reddish brown, glabrous, lustrous, the midrib extending beyond the tip as a short mucro. Achene 3-angled, obovoid, 0.6 mm long or less, pale brown, the surface finely alveolate-reticulate. (*Stenophyllus floridanus* Britt. in Nash)

Moist, to dry sands of road banks, fallow fields, clearings, alluvial shores of rivers and streams. Coastal plain, N.C. to s. Fla. and s. La.; Guat., Martinique. Naturalized from Old World Tropics.

8. Eleocharis (SPIKERUSHES)

Annual or perennial glabrous sedges. Annual forms tufted, commonly the tufts close and thus mat-forming. Perennials with short to long rhizomes or stolons; short rhizomatous forms often with the stems in tufts, those with long rhizomes forming extensive clones. Aerial stem unbranched and terminated by a single, erect spike not subtended by involucral bracts or leaves. Leaves consist of bladeless sheaths only. Scales of the spike spirally imbricated (rarely distichous) in several ranks. Flowers bisexual. Perianth bristles present in most species, usually 6–9, sometimes less or absent. Stamens 2 or 3. Achene lenticular or trigonous to nearly terete. Style bulbous at base, then slender and surmounted by 2 or 3 stigmatic branches, the bulbous style base hardening and forming a persistent tubercle.

The spikerushes all grow in wet situations, several of them almost always in water. The latter generally flower and fruit if in 3–9 dm of water but produce only vegetative growth in deeper water. Stems and roots of aquatic forms are eaten by geese and some ducks. Achenes are consumed in large quantities by certain waterfowl.

1. Spike not distinctly thicker than the supporting stem below.
  2. Stem nodose-septate.
    3. Perianth bristles robust, coarsely toothed, exceeding the achene body. 1. *E. interstincta*
    3. Perianth bristles slender, finely toothed, shorter than the achene body (often withering away early or easily detached). 2. *E. equisetoides*
  2. Stem not nodose-septate.
    4. Stems distinctly 4-sided. 3. *E. quadrangulata*
    4. Stems obscurely angled to terete.
      5. The stems relatively slender, mostly 1–2 mm thick; spikes 2.0 mm thick, tubercle distinct from the achene body.
        6. Achene body 1.5–2.5 mm long; scales 5.0 mm long. 4. *E. robbinsii*
        6. Achene body 0.8–1.5 mm long, scales about 3.5 mm long. 5. *E. elongata*
      5. The stem relatively coarse, mostly 3–5 mm thick; spikes 3.5–5.0 mm thick; tubercle confluent with the narrowed summit of the achene. 6. *E. cellulosa*
1. Spike distinctly thicker than the supporting stem below.
  7. Achene with several pronounced longitudinal ribs separating shallow valleys with fine horizontally elongate cells in longitudinal series.

8. Stems spongy, becoming wrinkled in drying. 7. *E. radicans*

8. Stems stiff, not becoming wrinkled in drying, furrowed or marked with raised parallel lines.

9. The stems finely capillary, about 0.5 mm thick; spikes flattish, the scales in 2–3 rows. 8. *E. acicularis*

9. The stems not finely capillary, about 1.0 mm thick; spikes terete, the scales many-ranked. 9. *E. wolfii*

7. Achene smooth or variously granular or reticulate but not with definite longitudinal ribs.

10. Achene lenticular or biconvex; stigmas 2.

11. Stem nodose-septate. 10. *E. montana*

11. Stem not nodose-septate.

12. Summit of leaf sheath loose, thin-membranous and hyaline.

13. Tubercle conic or depressed-conic, perched on the summit of the achene like a skullcap, its base considerably narrower than the summit of the achene.

14. Achene reddish just before maturity, maturing to black or dark purplish black. 12. *E. flavescens*

14. Achene olive green to dark olive green or almost brown. 13. *E. olivacea*

13. Tubercle truncately confluent with the summit of the achene. 28. *E. minima*

12. Summit of the leaf sheath firm and opaque, not membranous and hyaline.

15. Densely tufted annuals.

16. Base of the tubercle as broad as the summit of the achene and confluent with it. 11. *E. obtusa*

16. Base of tubercle not nearly as broad as summit of the achene.

17. Spike ovoid to subglobose; scales firm; achene body 1 mm long. 14. *E. geniculata*

17. Spike lance-ovoid to subcylindric; scales thin; achene body 0.5 mm long. 15. *E. atropurpurea*

15. Perennials with reddish purple rhizomes and leaf sheaths.

17a. Achene yellow; tubercle with a collarlike base. 16. *E. fallax*

17a. Achene yellow, or ripening to brown; tubercle conic and without a collarlike base. 17. *E. erythropoda*

10. Achene trigonous or nearly terete, not lenticular; stigmas 3.

18. The achene roughly and coarsely honey combed reticulate.

19. Stems erect, stiff, subterete; tubercle irregularly angled or rounded, as broad and long as the achene or longer. 18. *E. tuberculosa*

19. Stems capillary and sometimes reclining, distinctly angled; tubercle conic-subulate, base about half the width of the widest part of the achene. 19. *E. tortilis*

18. The achene smooth to finely reticulate.

20. Achene lustrous or glistening white. 20. *E. nana*

20. Achene pearly white (but not glistening), pale gray to dark reddish brown or yellow.

21. Scales of spike essentially 2-ranked, spike usually 2–4-flowered. 21. *E. baldwinii*

21. Scales of spike spirally imbricate; spike with more numerous flowers.

22. Tubercle confluent with summit of the achene, not constricted at the base.

23. Stems 1–7 cm tall, from slender stolons or rhizomes; summit of leaf sheath membranous or hyaline, loose; spikes 2–4 mm long. 22. *E. parvula*

23. Stems 10–80 cm tall or taller, from a thick vertical caudex; summit of leaf sheath very firm and stiff; spikes 6–20 mm long.

24. Achene olive or olive-brown, tapered from its broadest part into a conical tubercle. 23. *E. rostellata*

24. Achene black or nearly so, its summit truncate, the caplike tubercle depressed, almost flat atop the achene. 27. *E. melanocarpa*

22. Tubercle not confluent with summit of achene, constricted at base.

25. Perianth bristles none or shed by the time of ripening of the achene.

26. Plant cespitose, without rhizomes; stems finely wiry or capillary, to about 1 dm tall; achene smooth, pearly white to grayish. 24. *E. nigrescens*

26. Plant rhizomatous; stems much exceeding 1 dm tall; achene finely reticulate or granular, golden yellow to brown.

27. Summit of the leaf sheath truncate, the outer face with a mucro arising below the edge; achene obscurely angled, the angles rounded. 25. *E. compressa*

27. Summit of the leaf sheath oblique, the outer face triangular and with a strong midrib ending in a short mucro; achene with a longitudinal rib on each angle. 26. *E. tricostata*

25. Perianth bristles present.

28. The achene smooth.

29. Achene broadest at about the middle then narrowed and finally flared at the summit; base of tubercle truncate and confluent with summit of achene. 28. *E. minima*

29. Achene broadest above the middle then narrowed to a rounded summit; tubercle conic or depressed-conic, perched atop the achene like a duncecap.

30. Stems finely capillary; achene body 0.5–0.6 mm long, pearly white to grayish; scales membranous, usually with purplish stripes either side of the midrib distally. 29. *E. microcarpa*

30. Stems wiry but not finely capillary; achene body about 1 mm long, varying from olive to olive brown, usually maturing into a rich dark brown; scales subcartilaginous medially and firm-membranous marginally, straw-colored. 30. *E. albida*

28. The achene finely reticulate or cancellate.

31. Plant with rhizomes and lower parts of leaf sheaths purplish red.

32. Stems finely wiry, 0.2–0.3 mm thick, hard, weakly ascending; achene olive green, iridescent, conspicuously honeycomb-reticulate, the pits elongated vertically. 31. *E. verrucosa*

32. Stems coarser, (0.4–) 0.6–1.0 mm thick, erect, rather soft; achene ripening through yellow to brown or dark brown, very finely reticulate with nearly isodiametric pits. 32. *E. montevidensis*

31. Plant without rhizomes, the lower parts of the sheaths brownish. 33. *E. vivipara*

1. Eleocharis interstincta (Vahl) R. & S. Fig. 179

Coarse rhizomatous perennial. Stems stout, firm, erect, terete, conspicuously septate, 4–10 dm tall, the septae closer together near the spike. Leaf sheath membranous, often loose, the outer face at the summit broadly triangular-acute to abruptly acuminate. Spikes cylindric, to 4.5 cm long, many-flowered. Scales ovate-oblong, many-ranked, 5–6 mm long, straw-colored, finely striate, with narrow scarious margins, the summits broadly rounded. Achenes obovate, the body 1.8–2.2 mm long, with many distinct transverse rectangular alveolae forming fine longitudinal rows, a prominent annular thickening at the apex, straw-colored to gray; tubercle high-conic, about ¾ the length of the achene; bristles robust, exceeding the achene, prominently retrorsely barbed.

Usually in water, marshes, lakes, ponds, edges of streams, ditches and drainage canals. S. Fla., St. Vincent Is., Fla. Panhandle; Tex.; trop. Am.

2. Eleocharis equisetoides (Ell.) Torr. Fig. 180

Coarse rhizomatous perennial. Stems stout, erect, terete, conspicuously septate, the septae not crowded near the spike, 6–10 dm tall. Leaf sheath membranous, the outer face of the summit broadly triangular to abruptly acuminate. Spikes cylindric, 2–4 cm long, many-flowered. Scales oblong, about 5 mm long, straw-colored, striate, with broad scarious tips. Achenes obovate, body 2–2.5 mm long, very finely reticulate with many transversely linear cells, yellow to brown; tubercle narrowly conical, to about ½ the length of the achene, brown; bristles thin and soft, easily detached.

Usually in water, marshes, lakes, ponds, drainage ditches and canals. Mass. to cen. pen. Fla., to e. and s.e. Tex.; N.Y. to Mich. and Mo.

3. Eleocharis quadrangulata (Michx.) R. & S. Fig. 181

Coarse rhizomatous perennial. Stem stout, firm, erect, distinctly 4-sided (rarely 3-angled and 3-sided), not septate, 5–10 dm tall. Outer face of summit of leaf sheath long-acute or acuminate. Spike cylindric, to 5 cm long, many-flowered. Scales broad, 5–6 mm long, pale straw-colored, finely striate, with scarious margins, the tips rounded or obtuse. Achene narrowly obovate, body about 2 mm long, yellowish brown, reticulate, the alveolae in longitudinal rows of transversely linear cells; tubercle triangular-conic, with a constricted base, brown; bristles of various lengths, very slender and minutely barbed.

Commonly in water of ponds, lakes, marshy shores. Mass. to Ont., Mich., Ill., Wis., and Mo., s. to n. Fla., Tex. and Okla.

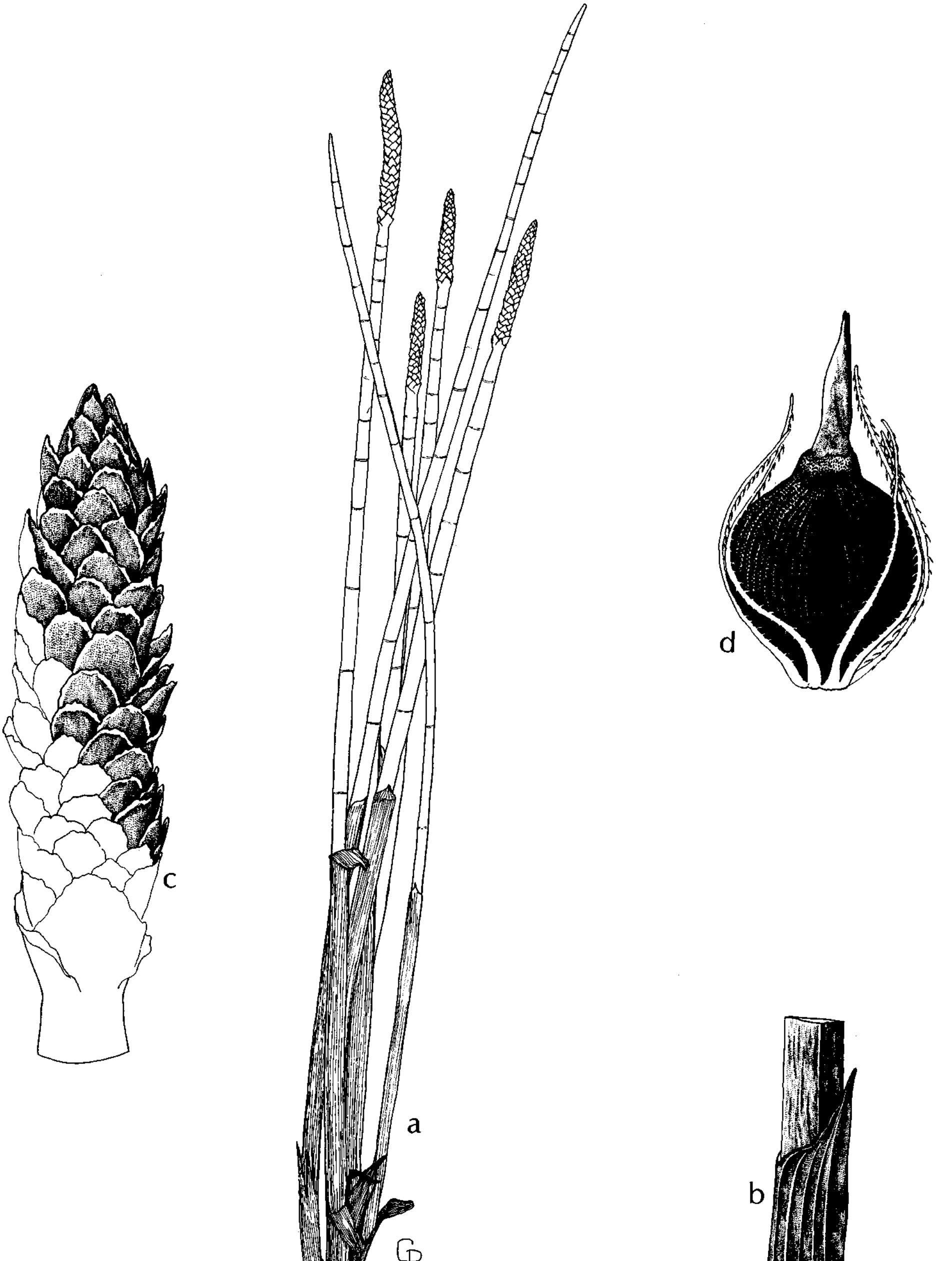

Fig. 179. **Eleocharis interstincta:** a, habit; b, summit of leaf sheath; c, spike; d, achene.

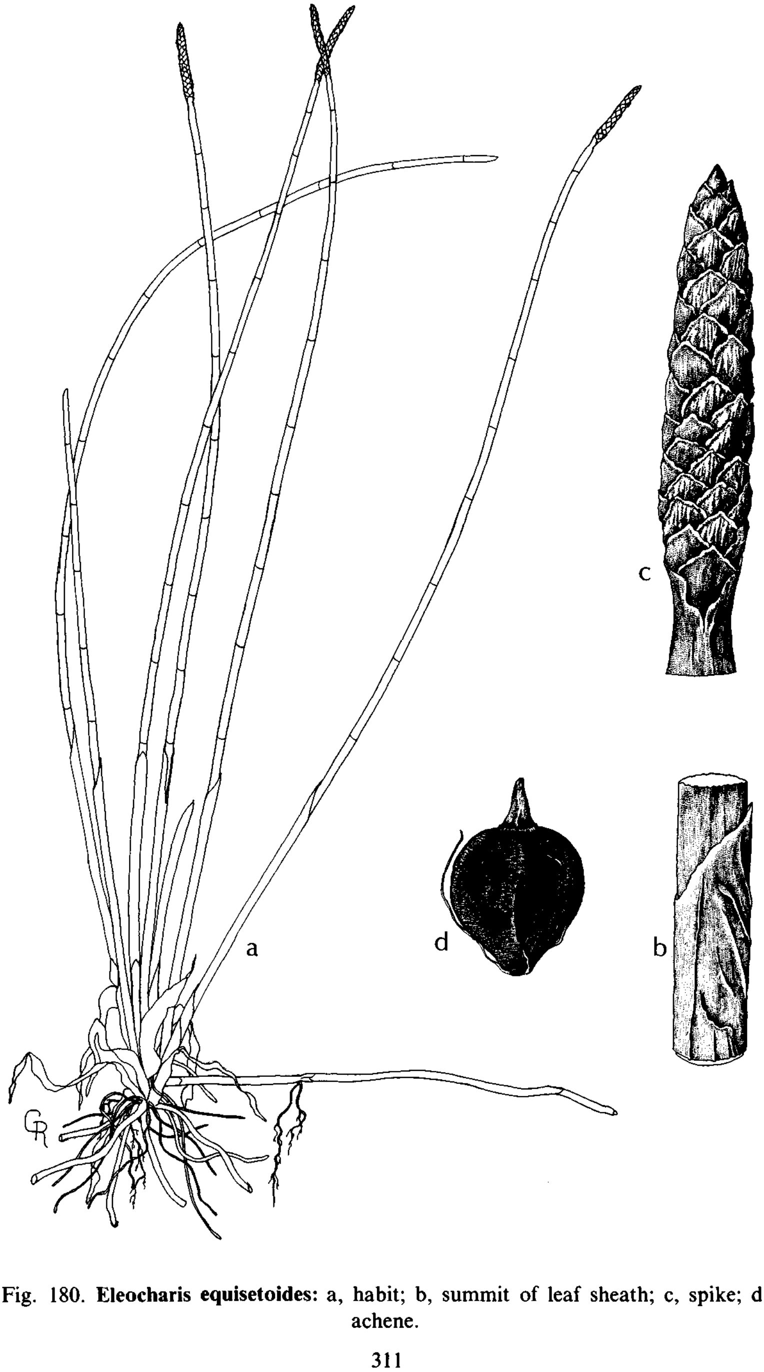

Fig. 180. **Eleocharis equisetoides:** a, habit; b, summit of leaf sheath; c, spike; d, achene.

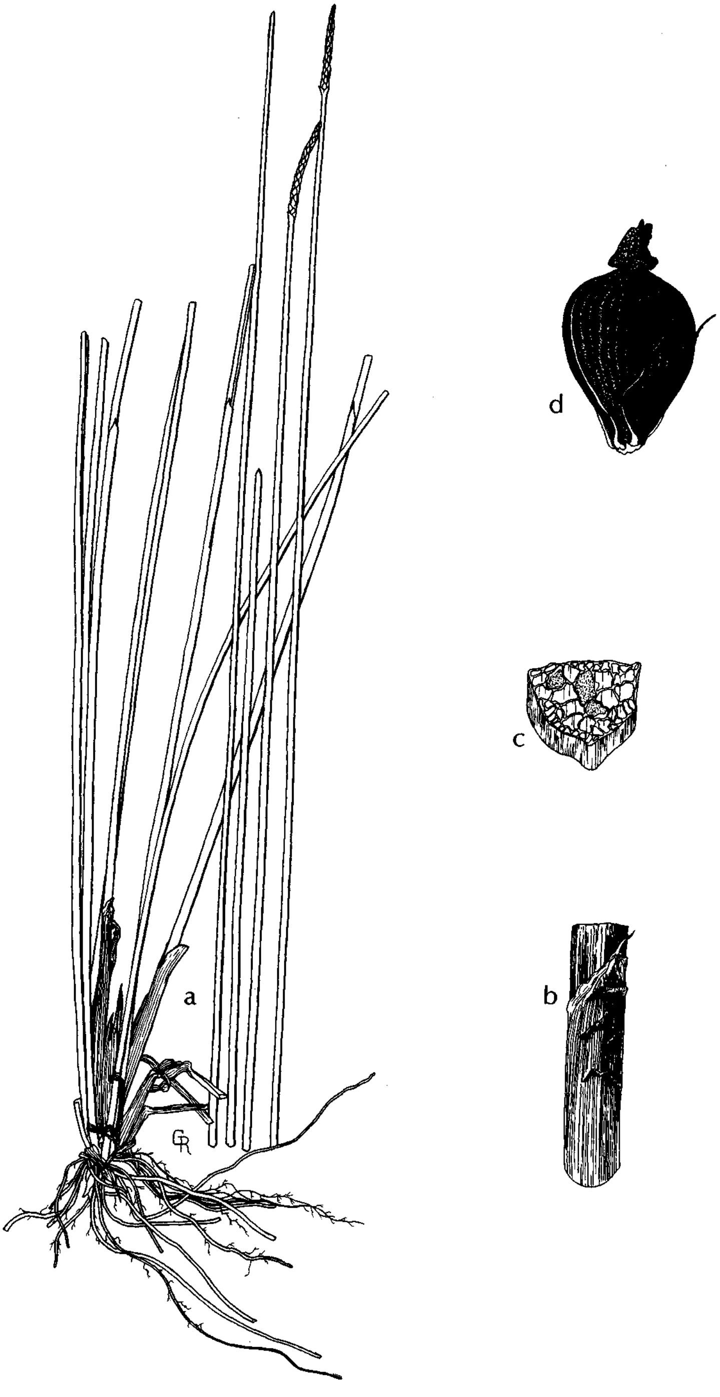

Fig. 181. **Eleocharis quadrangulata:** a, habit; b, summit of leaf sheath; c, cross section of stem; d, achene.

4. **Eleocharis robbinsii** Oakes.

Slender rhizomatous perennial. Stems slender, 2–8 dm tall, erect or weakly erect, or partially floating. Outer face of the summit of the leaf sheath triangular-acute. Spikes lanceolate-cylindric, 1–2.5 cm long, few-flowered. Scales lanceolate, 5–9 mm long, margins scarious and often reddish, the tips rounded to acute. Achenes straw-colored to brown, obovate, body 1.5–2.5 mm long, reticulate, the alveoli transverse-rectangular and in 15–18 longitudinal rows, the achene constricted at the summit to form a narrow neck; tubercle triangular-subulate, about 3 mm long, dark brown; bristles prominently retrorsely toothed, equalling or longer than the achene.

Usually in water and commonly forming extensive mats, ponds and lakes, marshes, ditches and drainage canals. N.S. and N.B. to Ont. s. to Fla. Panhandle, s.e. Ala.; inland, N.Y. to Ind., Wis.

5. **Elecocharis elongata** Chapm. Fig. 182

Similar to *E. robbinsii.* Scales smaller (3.5 mm long), achenes smaller (0.8–1.5 mm long) and with fewer rows of transverse cells (12). Perhaps conspecific.

Usually in water of lakes and ponds. Fla., adj. Ga. and Ala.; Jam.

6. **Eleocharis cellulosa** Torr. Fig. 183

Coarse perennial with long, stout rhizomes, forming extensive colonies. Stems terete, to 7 dm tall, 3–5 mm thick. Outer face of the summit of leaf sheath triangular then abruptly narrowed into a subulate tip; lower portions of sheaths membranous and loose. Spike cylindric, to 5 cm long, 3.5 mm thick, many-flowered. Scales broad, 5 mm long, the apices rounded, straw-colored, finely striate, the margins scarious. Achenes obovate, body about 2.0 mm long, reticulate, the alveolae slightly wider transversely or nearly isodiametric, light brown, the achenial wall extending well above the seed and confluently narrowed into the tubercle; bristles equalling the achene body, smooth.

Brackish to fresh lagoons and marshes, usually in water. Coastal plain, N.C. to s. Fla., w. to Tex.; Mex; C.Am., Berm., W.I.

7. **Eleocharis radicans** (A. Dietr.) Kunth. Fig. 184

Perennial with delicate rhizomes, forming low clumps or mats. Stems slender, pale green, spongy, 0.6–1.0 mm thick, 3–8 cm tall, becoming wrinkled when dry. Leaf sheaths membranous, whitish and loose at the summit. Spikes ovoid, 2–4 mm long, 6–12-flowered. Scales ovate-lanceolate, the mid-portion green and striate, the margins scarious-membranous. Achene narrowly elliptic-obovate, 0.7–0.9 mm long, obscurely trigonous or subterete, with several longitudinal lines separating shallow valleys with fine horizontally elongated cells in longitudinal series, pale gray to whitish yellow; tubercle skullcaplike; bristles variable in length, sometimes none.

Wet sands and mucks, marshy shores of ponds and lakes, often in floating mats. S.e. Va.; Fla. Panhandle; Mich.; e. and s.e. Tex., Okla.; Ariz., Calif.; Haw. Is.; W.I.; s. S.Am.

8. **Eleocharis acicularis** (L.) R. & S. Fig. 184

Perennial with capillary runners, usually matted. Stems furrowed, filiform, 2–20 cm tall. Leaf sheaths thin, reddish below, loose and thin-membranous, the summit subtruncate. Spikes ovate-lanceolate to linear, flattish, 3–6 mm long, 2–10-flowered, usually 5–8. Scales keeled, with a green midrib and membranous, often reddish brown sides. Achenes narrowly elliptic-obovate, obscurely trigonous or subterete, with several longitudinal ribs separating shallow valleys with fine horizontally elongate cells in longitudinal series, pale gray; tubercle minute, skullcaplike; bristles few or lacking.

Wet sands and mucks, pools, ditches, shores of ponds, lakes and streams. Greenland to Alaska, s. to Fla. Panhandle and n. Mex.; Eurasia.

9. **Eleocharis wolfii** Gray in Patters.

Plant with very slender rhizomes and forming mats or clumps. Stems to about 3 dm tall,

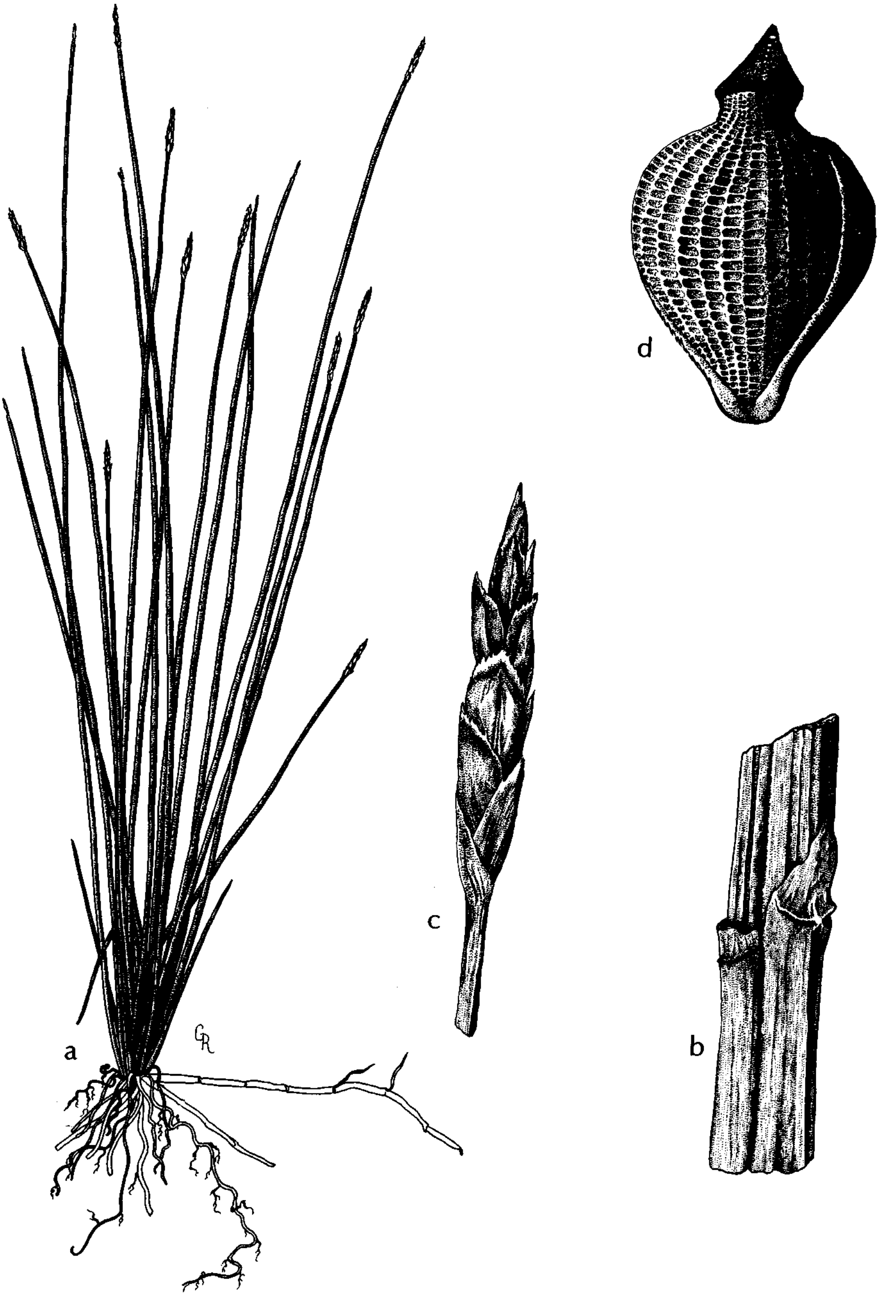

Fig. 182. **Eleocharis elongata:** a, habit; b, summit of leaf sheath; c, spike; d, achene.

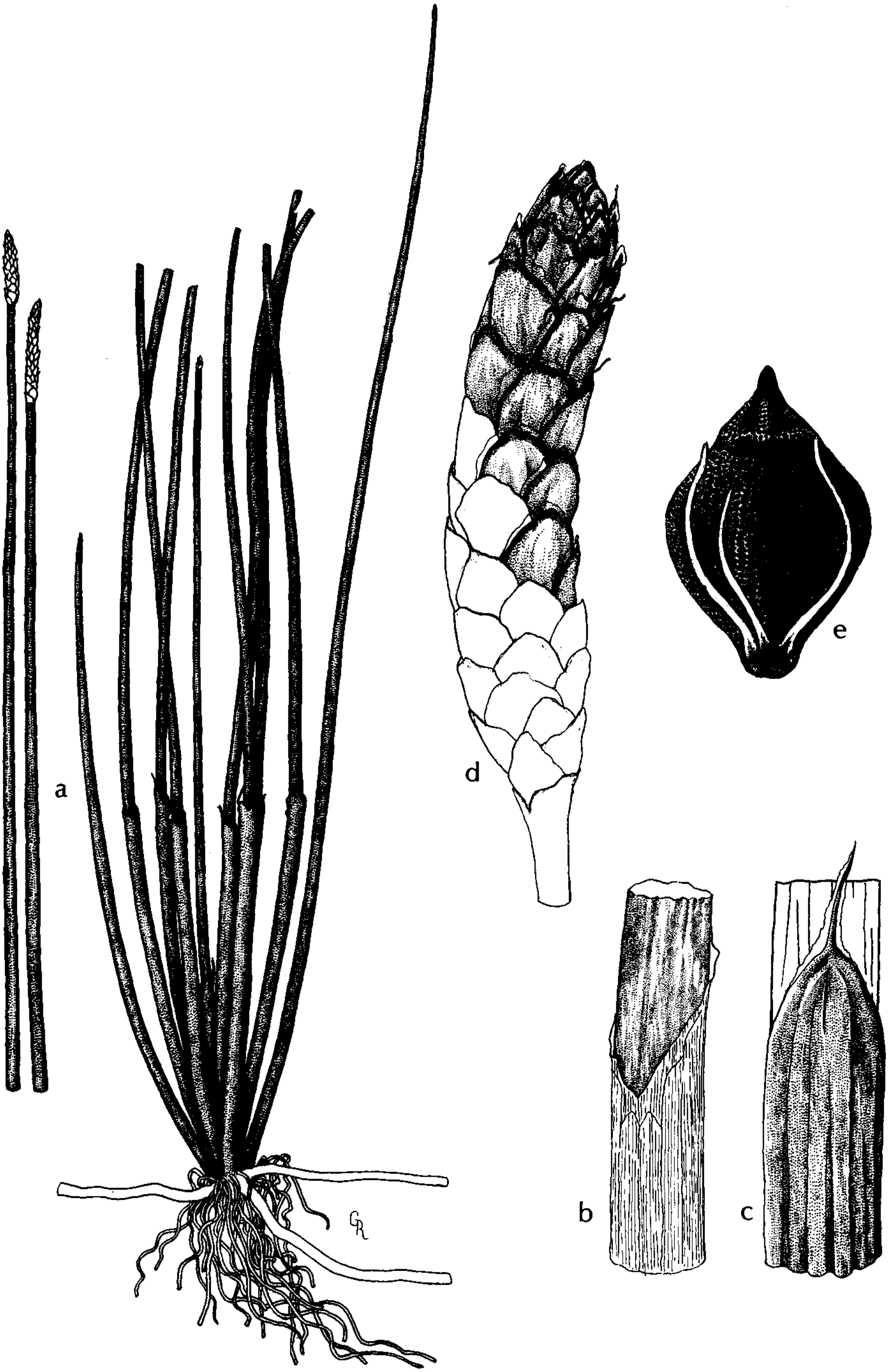

Fig. 183. **Eleocharis cellulosa:** a, habit; b–c, summit of leaf sheath (two views); d, spike; e, achene.

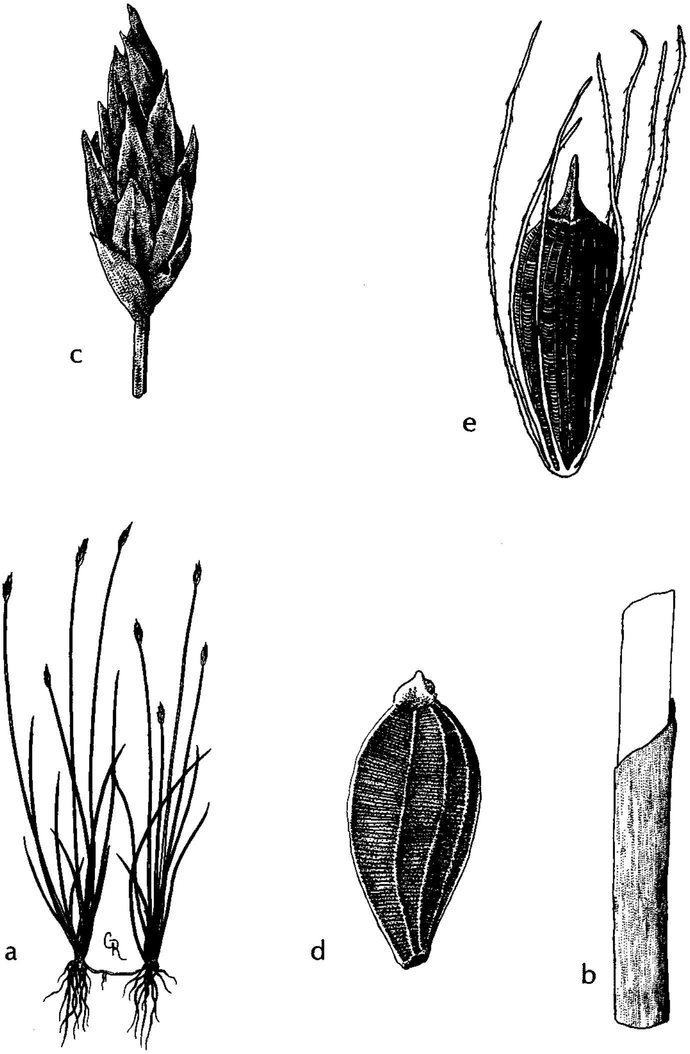

Fig. 184. a–d, **Eleocharis acicularis:** a habit; b, summit of leaf sheath; c, spike; d, achene; e, **Eleocharis radicans:** achene.

marked with raised parallel lines. Leaf sheaths purplish red below, the uppermost portion loosely enveloping the stem and white-membranous, the outer face free for some distance and tapering to the tip. Spikes lance-ovate, acute, 5–10 mm long. Scales lance-ovate, acute or acuminate, midsection green to straw-colored, usually a broad purplish-brown stripe to either side, the margins green to stramineous. Achene body narrowly obovate, 0.8–0.9 mm long, obscurely trigonous to terete, with about 9 longitudinal ridges and between these numerous horizontally elongate cells; perianth bristles none; tubercle with a flattened base and conic-apiculate summit.

Wet open sites. S. Ind. to s. Sask., s. locally to Tenn., n.e. Ala., La. and Kans., Mo., and Colo.

10. Eleocharis montana (HBK.) R. & S. Fig. 185

Perennial with stout rhizomes. Stems nodose-septate, coarse, erect, to 1 m tall. Leaf sheath finely striate, purplish red, summit obliquely subtruncate, firm, with a toothlike lobe on the outer face. Spikes ovate-lanceolate to oblong, 0.8–2.4 cm long, many-flowered. Scales ovate, 1.5–2 mm long, acute, the tips scarious. Achene biconvex, obovate, finely reticulate, body 0.9–1.1 mm long, brown; tubercle depressed-deltoid, its base nearly as wide as the apex of the achene; bristles unequal, some as long as the achene body, smooth. (*E. nodulosa* (Roth) Schultes)

Marshy shores and peaty depressions. Fla. and s. Ga. to Tex. and Ariz.; trop. Am.

11. Eleocharis obtusa (Willd.) Schultes in R. & S. Fig. 186

Annual (rarely perennial), densely cespitose. Stems terete, erect, 1–5 dm tall. Leaf sheaths furrowed or corrugated, the summits firm-cartilaginous, oblique, the outer face apiculate. Spikes ovoid to cylindric, to about 12 mm long, many-flowered. Scales ovate to oblong, 2 mm long, pale green, with prominent green midrib, the tips hyaline. Achenes biconvex, obovate, body 0.8–1.5 mm long, pale to dark brown, smooth and shiny, with wirelike margins; tubercle broadly deltoid, its base nearly as wide as the summit of the achene; bristles variable, from exceeding the tubercle to absent.

Muddy and sandy or peaty wet shores, often in shallow water, edges of swamps, marshes and boggy places. N.S. s. to Fla. Panhandle and Tex.; B.C. and Idaho to n. Calif.; Colo. and N.Mex.

12. Eleocharis flavescens (Poir.) Urban. Fig. 187

Perennial, delicately rhizomatous and mat-forming. Stems firm to flaccid, often spongy, to 3.5 dm tall. Summit of leaf sheath very loose, thin-membranous and hyaline. Spikes ovate-oblong to lanceolate, 3–6 mm long. Scales elliptic to oblong-lanceolate, 2–2.5 mm long, thin, the mid portions pale green or straw-colored, the margins scarious. Achenes biconvex, obovate, body 0.6–1.0 mm long, purplish black, smooth and shiny; tubercle skullcaplike, minute; bristles pale, shorter than to equalling the achene or longer, retrorsely toothed. (*E. flaccida* (Reichb.) Urban; *E. ocreata* (Nees) Steud.; *E. practicola* Britt.)

Wet peat, sands and mucks of shores, banks, pools and depressions. Coastal plain, N.J. to Fla., w. to e. Tex.; W.I., Mex.; e. S.A.

This plant and *E. geniculata* are in many respects similar. The latter has the summit of the leaf sheaths firm and opaque rather than thin-membranous and hyaline as in this.

13. Eleocharis olivacea Torr. Fig. 188

Similar to the preceding vegetatively; however, plants growing in flowing water and nearly submersed have a trailing, lax habit. Scales of the spikelet (some of them at least) with definite green midribs and reddish purple on either side of the midrib, between it and the scarious margins. Achene shape as in the preceding, perhaps a very little larger, its color olive green to dark olive green or almost brown.

Wet sands and peats, sometimes in flowing water. N.S. to s. Ont., Minn., Mich., Ohio, locally southward in the East to Fla. panhandle.

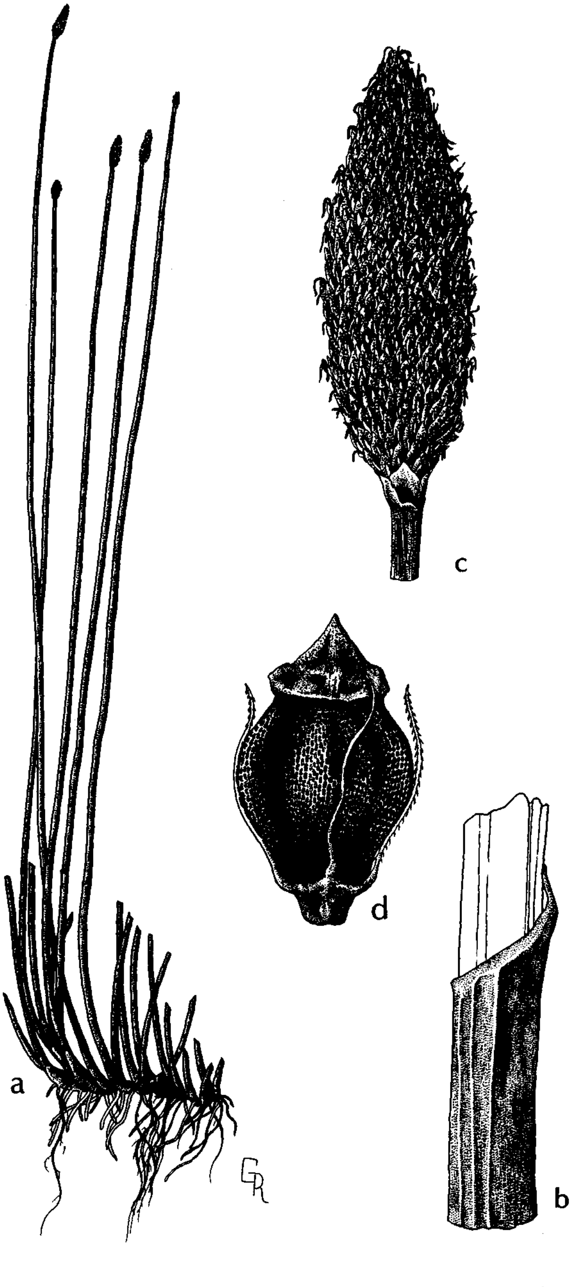

Fig. 185. **Eleocharis montana:** a, habit; b, summit of leaf sheath; c, spike; d, achene.

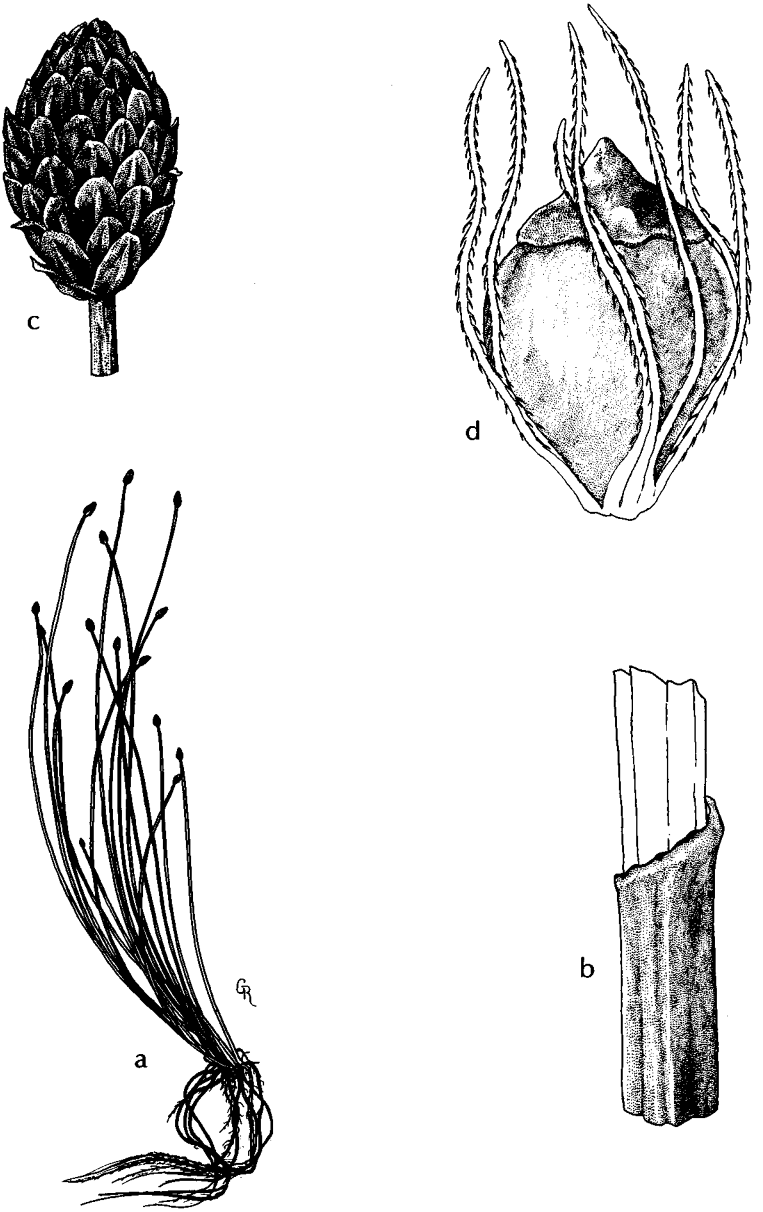

Fig. 186. **Eleocharis obtusa:** a, habit; b, summit of leaf sheath; c, spike; d, achene.

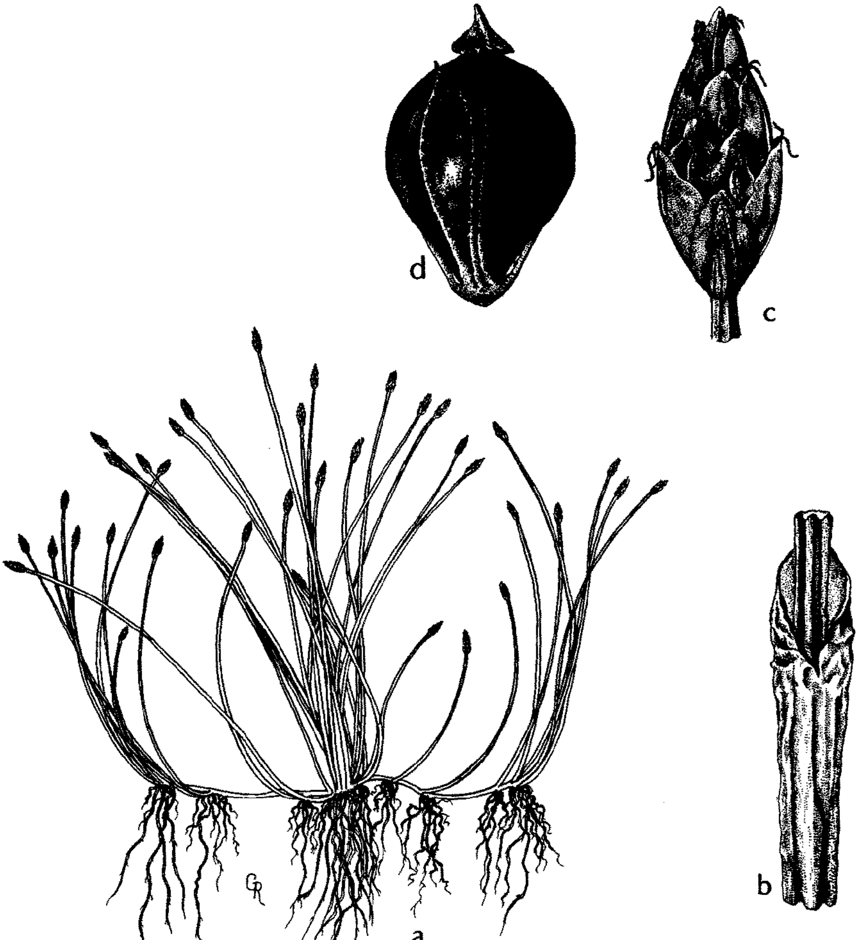

Fig. 187. **Eleocharis flavescens:** a, habit; b, summit of leaf sheath; c, spike; d, achene.

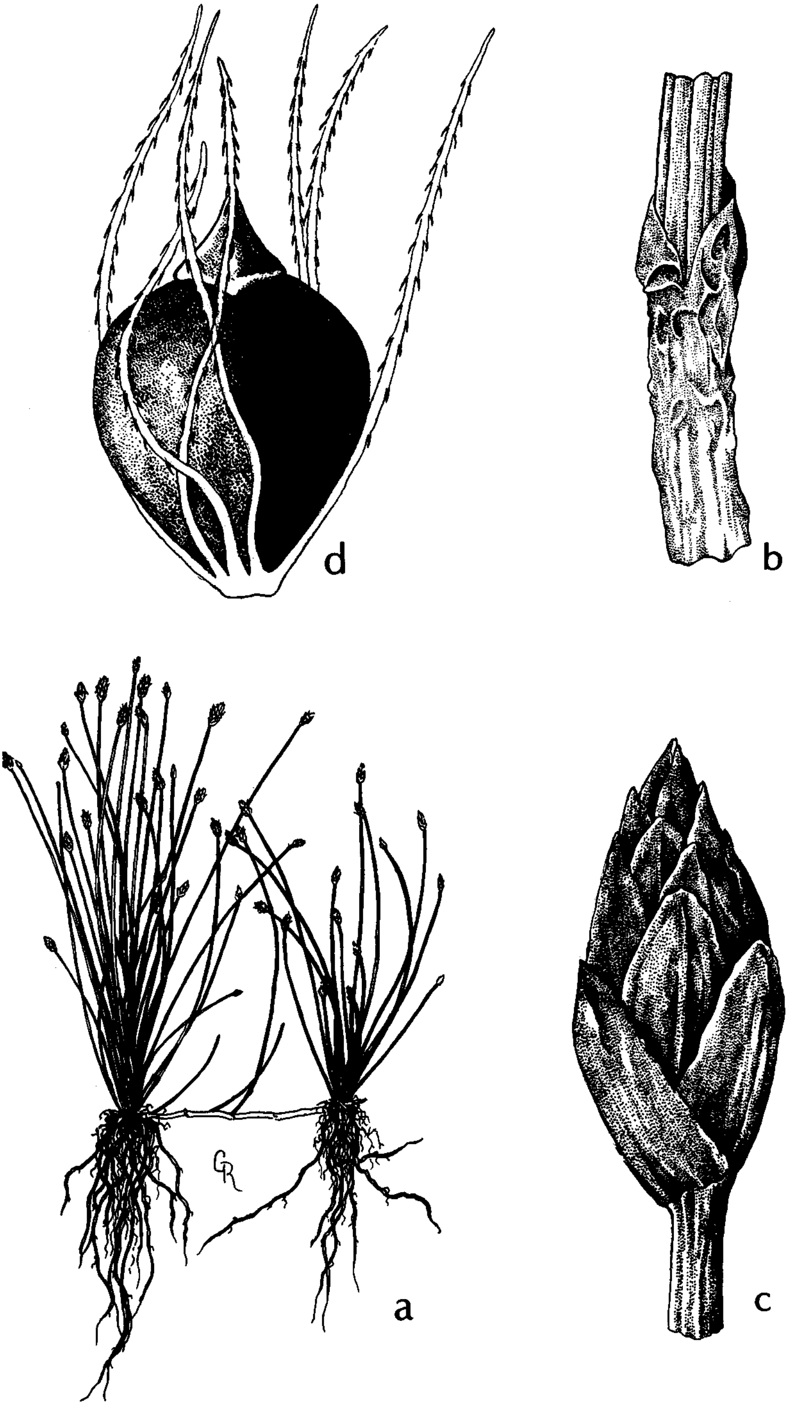

Fig. 188. **Eleocharis olivacea:** a, habit; b, summit of leaf sheath; c, spike; d, achene.

14. Eleocharis geniculata (L.) R. & S. Fig. 189

Annual, densely cespitose. Stems erect, firm, wiry, 0.4–1.0 mm thick, to 4 dm tall. Summit of the leaf sheath firm, oblique, the outer face elongate-triangular, acute. Spikes mostly ovoid, 3–6 mm long, many-flowered. Scales ovate to short-oblong, firm and opaque except for the scarious margin. Achenes biconvex, obovate, body 0.7–1.0 mm long, black or purplish black shiny and smooth; tubercle minute, skullcaplike; bristles brown, equalling or barely exceeding the achene, sometimes shorter or absent. (*E. caribaea* (Rottb.) Blake)

Wet fresh to brackish sites, often in shallow water. S.C. to Fla., w. to Calif., n. in the interior to the Great Lakes Basin; pantrop.

15. Eleocharis atropurpurea (Retz.) Kunth. Fig. 189

Annual, densely cespitose. Stems finely wiry, erect, 0.2–0.3 mm thick, 3–12 cm tall. Bases of the leaf sheaths usually purplish, summit oblique, thin to firm, the outer face triangular to triangular-attenuate. Spikes ovoid to cylindric, 2–4 cm long, many-flowered. Scales oblong to ovate, 1.0 mm long, usually keeled, with a green midrib and thin-membranous, usually purplish red sides. Achenes biconvex, obovate, body 0.5–0.6 mm long, black, shiny and smooth; tubercle conic, minute, skullcaplike; bristles white, slender, shorter than the achene, or lacking.

Wet fresh to brackish soils, often in shallow water. Ga. and Fla., w. to Calif., locally in the interior to Iowa, Nebr., Colo. and Wash.; pantropical.

16. Eleocharis fallax Weath. Fig. 190

Perennial with conspicuous purplish red rhizomes. Stems wiry, to 7 dm tall. Summit of leaf sheath cartilaginous, slightly oblique or subtruncate, the outer face with or without a mucro. Spikes lanceolate to lance-ovate or oblong, to 16 mm long. Scales ovate, thin, 2–3 mm long, with scarious margins, apices rounded. Achenes obovate, lenticular to barely trigonous, body 1.2–1.7 mm long, yellow to brown, surficially very finely reticulate; tubercle short-conic with a white collarlike ring at the base; bristles unequal, shorter than the achene to equalling the tubercle. (*E. ambigens* Fern.; *E. calva* sensu Small, not Torr.)

Marshy clearings and borders of swamps, brackish marshes. Coastal plain, Mass. to s. Fla., w. to Tex.; Cuba.

17. Eleocharis erythropoda Steud.

Perennial with slender purplish red rhizomes, often mat-forming. Stems slenderly wiry, to 6 dm tall. Leaf sheaths purplish-red, the summit nearly truncate. Spike lanceolate 0.4–1.5 cm long, many-flowered, the basal scale completely encircling the stem. Scales ovate-oblong, 2.5 mm long, usually flecked with purple on either side of the midrib, the margins scarious, apices mostly rounded. Achenes biconvex, yellow to brown, surficially smooth or with just a suggestion of granularness, the body 1.0–1.2 mm long, tubercle conical, without a collarlike base; bristles 5–6, retrorsely barbed, lengths variable, from shorter than the achene body to exceeding the tubercle. (*E. calva* Torr.)

Marshes and marshy banks of streams and shores. Que. to Huds. Bay and Man., s. to N.C. and Tenn., Ill., Mo., Nebr.

18. Eleocharis tuberculosa (Michx.) R. & S. Fig. 191

Perennial, cespitose. Stems erect, stiff, coarsely wiry, 0.5–1.0 mm thick, compressed, to 8 dm tall. Summit of the leaf sheath firm, oblique, striate, the outer face triangular-acute. Spikes ovoid to lance-ovoid, 0.5–1.5 cm long, many-flowered. Scales ovate to suborbicular, obtuse to rounded, 3–3.5 mm long, coriaceous and opaque except for scarious margins. Achenes trigonous, obovate, 1–1.5 mm long, roughly and coarsely honeycombed reticulate; tubercle as broad and as long as the achene body or longer, capping but often almost free of the achene, whitish and spongy; bristles usually exceeding the achene but not the tubercle, antrorsely toothed.

Wet sandy, peaty or mucky shores, swamps, ditches and wet clearings. N.S. to cen. pen. Fla., w. to e. and s.e. Tex.; Ark., Tenn.

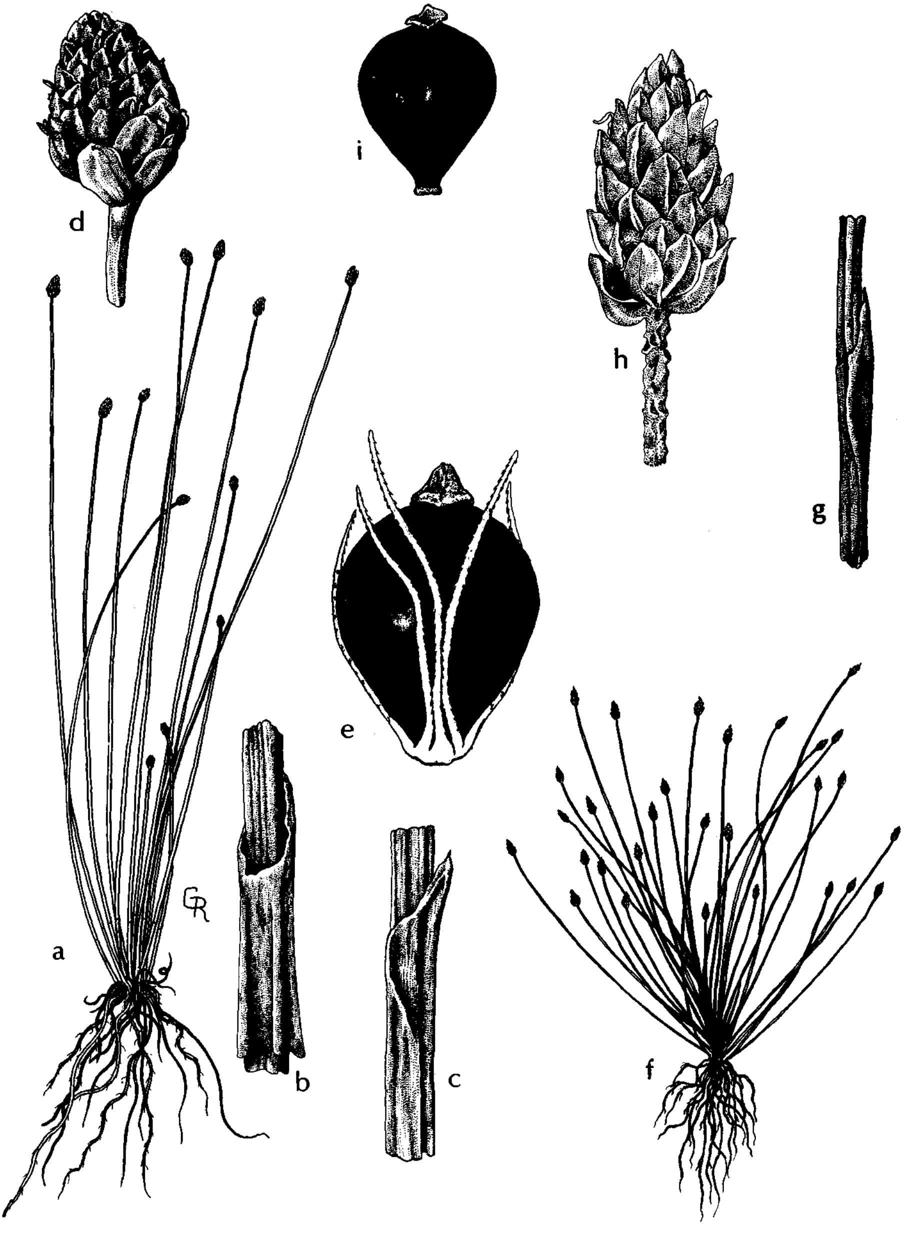

Fig. 189. a–e, **Eleocharis geniculata:** a, habit; b–c, summit of leaf sheath (two views); d, spike; e, achene; f–i, **Eleocharis atropurpurea:** f, habit; g, summit of leaf sheath; h, spike; i, achene.

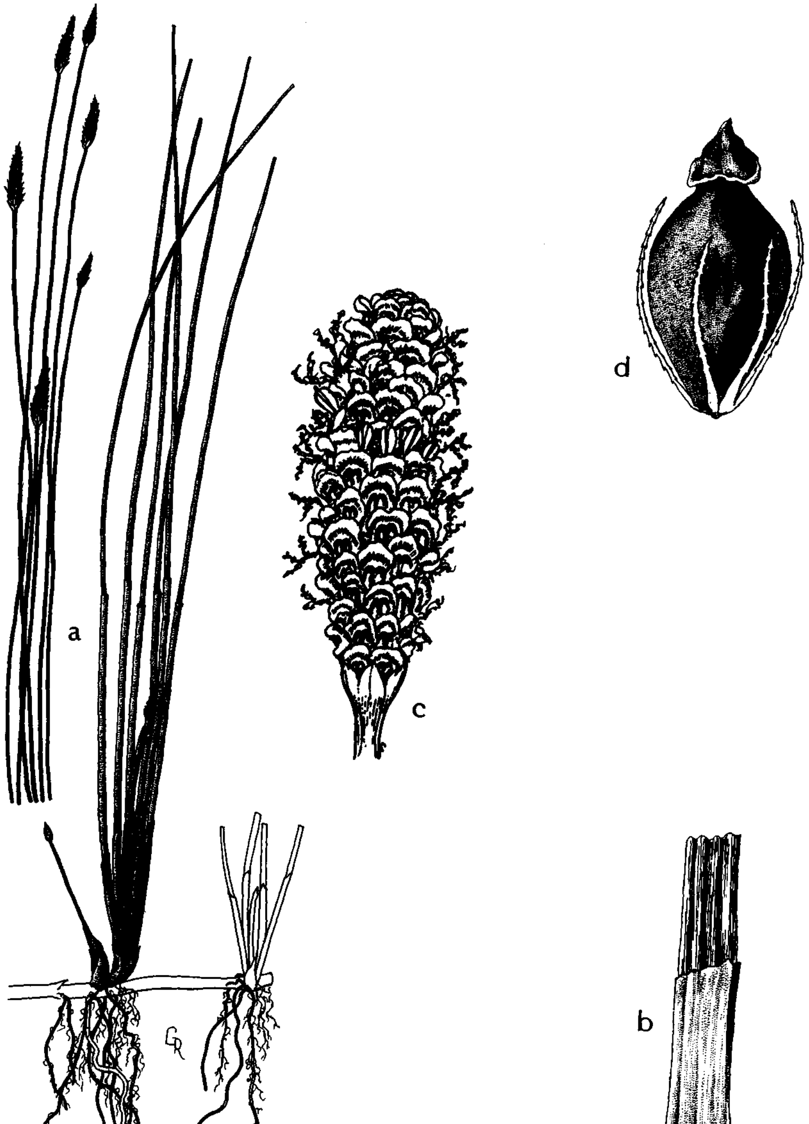

Fig. 190. **Eleocharis fallax:** a, habit; b, summit of leaf sheath; c, spike; d, achene.

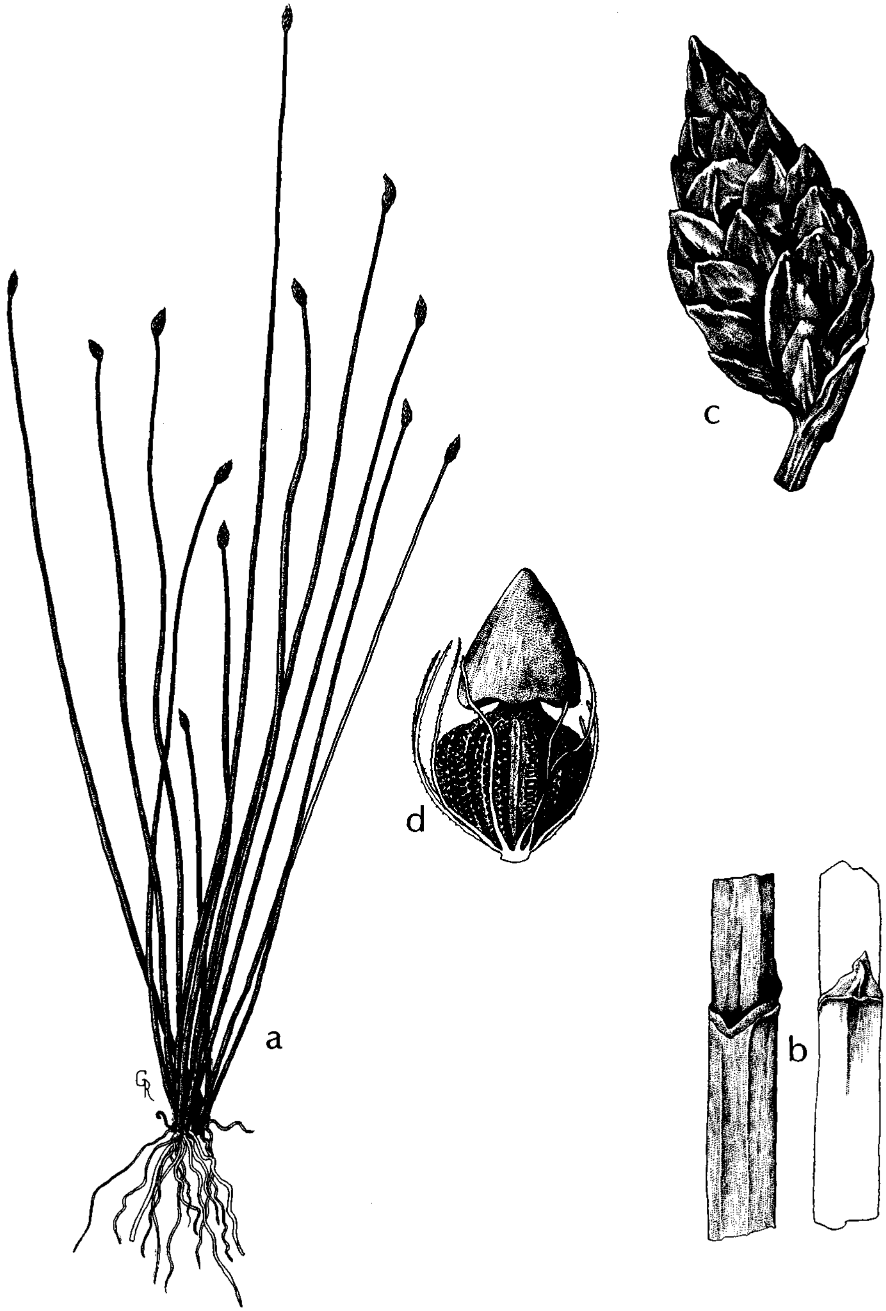

Fig. 191. **Eleocharis tuberculosa:** a, habit; b, summit of leaf sheath (two views); c, spike; d, achene.

19. Eleocharis tortilis (Link) Schultes in R. & S. Fig. 192

Perennial, cespitose. Stems slenderly wiry and flexuous, lax or reclining, 3-angled, often twisted, to 8 dm tall. Summit of the leaf sheath firm, oblique, the outer face short-triangular, the tip thickish-cartilaginous. Spike ellipsoid to ovoid, 6–14 mm long, few–many-flowered. Scales oblong, 2.5–3 mm long, firm, with brownish sides and stiff-scarious margins. Achenes trigonous, obovoid, angles with wirelike longitudinal bands, body 1.2–1.7 mm long, grayish olive to black, with honeycomb reticulation; tubercle conic-subulate, the base about ½ the width of the widest part of the achene; bristles equalling or surpassing the tubercle, retrorsely barbed. (*E. simplex* of authors, not (Ell.) A. Dietr.)

Boggy and springy areas, wet woods, swamps and wet thickets. Coastal plain, L.I. to Fla. Panhandle, w. to e. Tex.

20. Eleocharis nana Kunth.

Annual, cespitose. Stems finely wiry, to 12 cm tall. Summit of leaf sheath appressed-acute to somewhat inflated. Spike ovate to elliptic, 3–4 mm long, 5–8-flowered. Scales straw-colored, the margins hyaline. Achene trigonous, 1–1.3 mm long, lustrous white, finely reticulate; tubercle short-pyramidal; bristles equalling to exceeding the achene. (*E. camptotricha* (C. Wright) Clarke)

Boggy and marshy lake shores, borders of cypress depressions. Cen. pen. Fla.; Cuba; S. Am.

21. Eleocharis baldwinii (Torr.) Chapm. Fig. 193

Perennial, delicately stoloniferous and mat-forming. Stems capillary, 3–20 cm tall, often proliferous, especially when in water. Leaf sheaths reddish, summit oblique, membranous and loose. Spike lanceolate or narrowly ellipsoid, flattish, 4–7 mm long, few-flowered. Scales 2-ranked or appearing so because of the flatness of the spike, folded from the midrib and boatlike; lowest scale much shorter than the others. Achenes trigonous, smooth, ovate, grayish olive, body about 0.5–0.8 mm long; tubercle conic-subulate; bristles unequal, shorter than to equalling or exceeding the achene. (*E. capillacea* sensu Small, not Kunth; *E. prolifera* Torr.)

Wet sands and peaty sands, often in water, clearings, shores, swamps, ditches and depressions. Coastal plain, N.C. to Fla., w. to La.

22. Eleocharis parvula (R. & S.) Link. Fig. 193

Densely tufted, with slender stolons or rhizomes. Stems slender, spongy, 2–7 cm tall. Summit of leaf sheath oblique, thin, the outer face tonguelike. Spike ovoid, 2–5 mm long, 2–10-flowered. Scales ovate, obtuse, straw-colored, thin-opaque. Achene trigonous, narrowly obovate, light brown, smooth, 0.8–1.5 mm long including the confluent conical tubercle; bristles equalling or exceeding the achene, or lacking. (*E. membranacea* (Buckl.) Gilly; *Scirpus nanus* Spreng.)

Wet saline or brackish shores, in mud and shallow water of lakes and ponds, stream banks. Coastal, Nfld. to Fla. w. to Tex. and Okla.; inland, N.Y. to Mich. and Mo.; B.C. to Mex.; Cuba; Eurasia and Afr.

23. Eleocharis rostellata Torr. Fig. 194

Perennial with short, thick, erect caudex. Stems coarsely wiry, sulcate, erect, to 8 dm tall, 1.0–1.4 mm thick; some often arching and taking root when the spike is on the ground. Summit of the leaf sheath slightly oblique, firm, coriaceous, the outer face very broadly rounded. Spikes ovoid to fusiform, acute, 0.8–2 cm long, many-flowered. Scales ovate-lanceolate to ovate, 3–3.5 mm long, opaque, the margins thick-scarious. Achenes trigonous, the angles not sharp, olive brown, lustrous, obovoid, body 1.5–1.7 mm long and confluently narrowed into the pyramidal tubercle; bristles equalling the tubercle, prominently retrorsely toothed.

Saline, alkaline and calcareous marshes, prairies and swamps. N.S. to Fla.; locally inland from N.Y. to Ill., Kans., Okla., Tex.; widespread in w. U.S.; also in trop. Am.

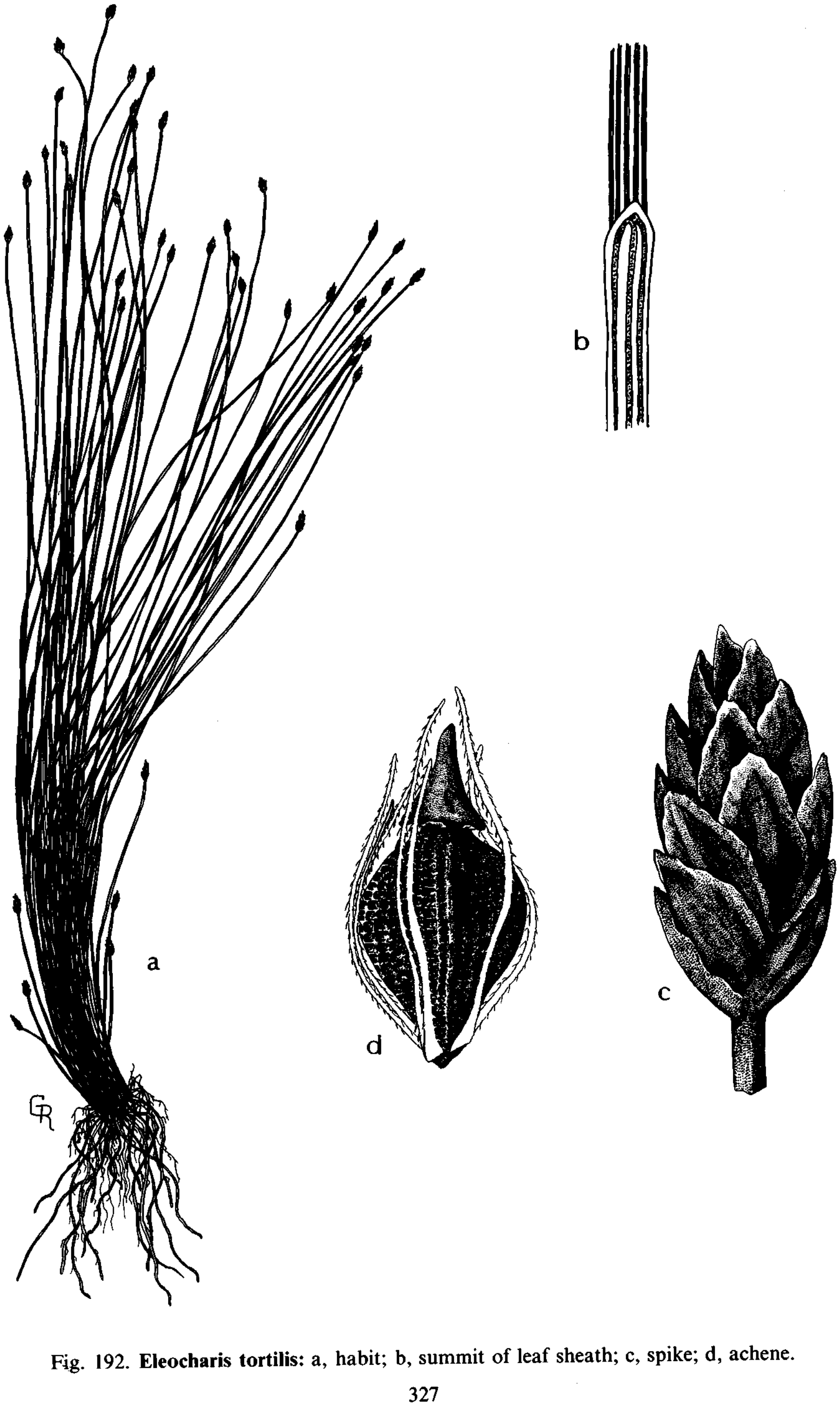

Fig. 192. **Eleocharis tortilis:** a, habit; b, summit of leaf sheath; c, spike; d, achene.

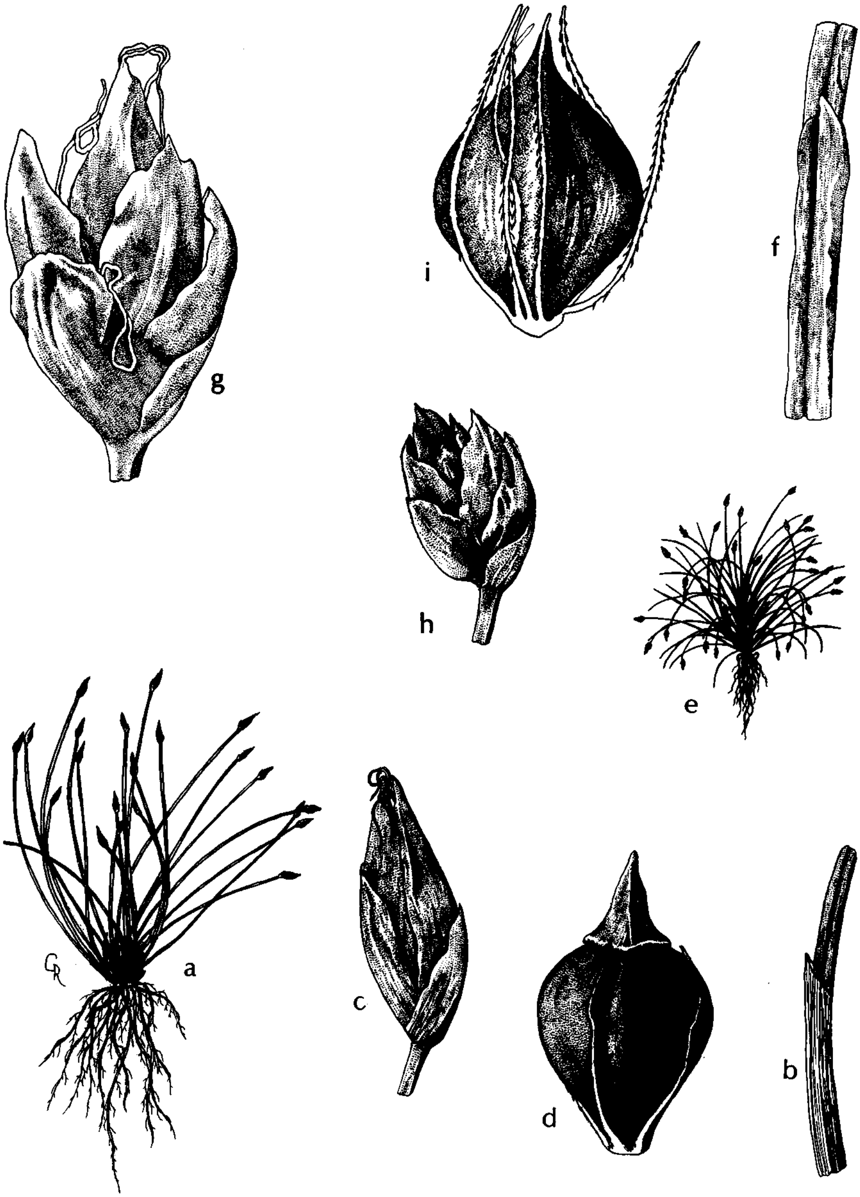

Fig. 193. a–d, **Eleocharis baldwinii:** a, habit; b, summit of leaf sheath; c, spike; d, achene; e–i, **Eleocharis parvula:** e, habit, f, summit of leaf sheath; g–h, spikes; i, achene.

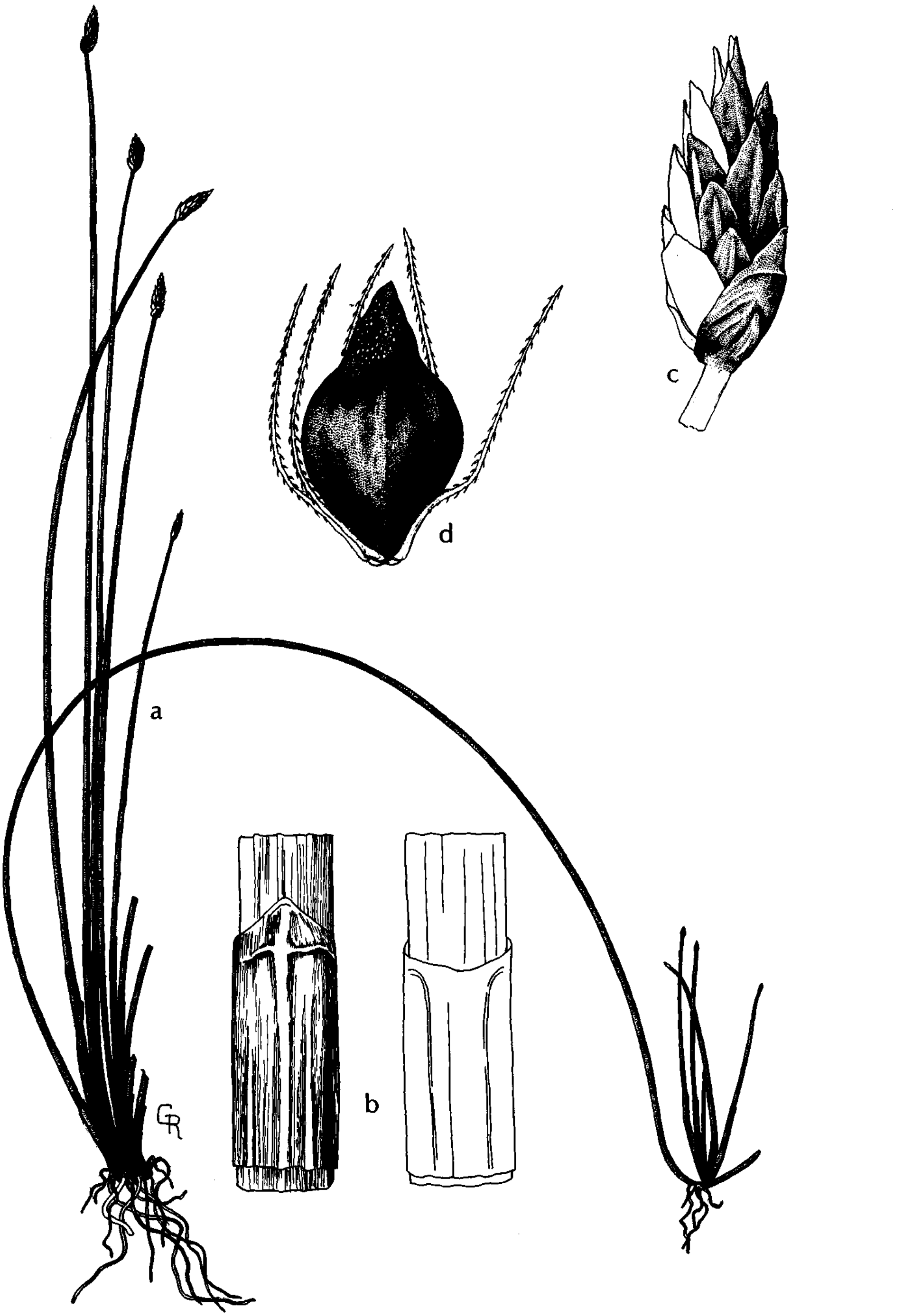

Fig. 194. **Eleocharis rostellata:** a, habit; b, summit of leaf sheath (two views); c, spike; d, achene.

24. Eleocharis nigrescens (Nees) Steud. Fig. 195

Annual, cespitose. Stems finely wiry, erect, to 1 dm tall. Lower portions of leaf sheaths purplish red, summit firm but thin, the outer face keeled and long-pointed. Spike ovoid, 2–3 mm long, many-flowered. Scales keeled, 1–1.5 mm long with broad scarious margins. Achenes trigonous, body about 0.4 mm long, obovoid, the angles with longitudinal wirelike bands, pearly gray to grayish brown, smooth and shiny or somewhat granular; tubercle minute, skullcaplike; bristles none. (*E. carolina* Small)

Presumably introduced in S.C. and Fla., becoming weedy in pen. Fla.; pantropical.

25. Eleocharis compressa Sulliv.

Perennial with stout purplish rhizomes. Stems in tufts from the rhizome, erect, to 2 dm tall, strongly compressed. Leaf sheaths purplish red, the apex truncate or only slightly oblique, with a mucro. Spike ovate, 5–12 mm long, many-flowered. Scales ovate-lanceolate, membranous, the margins and tips hyaline, the tips acuminate or becoming bifid or even lacerate in age. Achene ovoid, trigonous, about 1 mm long, yellow to brown, surface granular-roughened or finely reticulate; tubercle conic with a depressed base. Bristles 1–5, early deciduous (and thus not usually seen). (*E. elliptica* Kunth var. *compressa* (Sulliv.) Drapalik & Mohlenb.)

Rare in our range, shallow water of ponds, streams, ditches. W. Que. to Sask., s. to n.e. Va., n. Ga. and Ala. to n.e. Tex., Okla., Colo.

26. Eleocharis tricostata Torr. Fig. 196

Perennial with prominent long rhizomes. Stems stiff-wiry, 2–6 dm tall. Leaf sheaths reddish, summit slightly oblique, with a cartilaginous collar, the midrib extending into a mucro. Spike ellipsoid-cylindric to ovate-lanceolate, 6–15 mm long, many-flowered. Scales ovate, obtuse, 1–2 mm long, thin and usually reddish, broadly rounded at the summit. Achenes obovate, trigonous, the angles with longitudinal wirelike bands, body 0.8–1.0 mm long, yellowish brown, finely reticulate and appearing granular and dull, constricted apically; tubercle depressed-conic; bristles none.

Sandy, peaty and mucky soils, flatwoods depressions, cypress-gum swamps and depressions, pond and lakeshores, fresh to brackish marshes. Coastal plain, locally Mass. to Mich. and Mass. to Va., thence s. to n. and n. pen. Fla.

27. Eleocharis melanocarpa Torr. Fig. 197

Perennial, cespitose from stout caudices. Stems erect, coarsely wiry, flattened, 1–6 dm tall. Summit of leaf sheath truncate, firm and cartilaginous, the outer face with a stiff subulate tooth. Spike ellipsoid to narrowly ovoid, 4–12 mm long, many-flowered. Scales ovate, the tips rounded, 3–4 mm long, firm and opaque, the margins scarious. Achenes trigonous, obpyramidal, body 0.8–1.0 mm long, shiny and black, summit truncate and triangular; tubercle caplike and covering the entire top of the achene; bristles equalling or shorter than the achene.

Wet sandy or peaty shores and pinelands, sometimes in dense stands in a wide zone on pondshores, often persisting on dry sands or peats after water levels recede. Coastal plain, Mass. to Fla., w. to Tex.; inland in Mich. and n. Ind.

28. Eleocharis minima Kunth. Fig. 198

Perennial, delicately stoloniferous or rhizomatous and mat-forming. Stems finely capillary, quadrangular-sulcate, 3–6 cm tall. Leaf sheaths reddish, apically long-oblique, hyaline and inflated. Spike ovate to lanceolate, 2–5 mm long, 5–10-flowered. Scales ovate-lanceolate, keeled, acute, 1.5–2 mm long, with green midrib, reddish brown sides and thin-scarious margins; scales sometimes appearing distichous. Achenes lenticular or trigonous, smooth, widest at about the middle, narrowed to a truncate or truncate-triangular summit, surficially bone white or with brown speckles or streaks on a grayish background; base of tubercle truncate, covering the top of the achene; bristles slightly

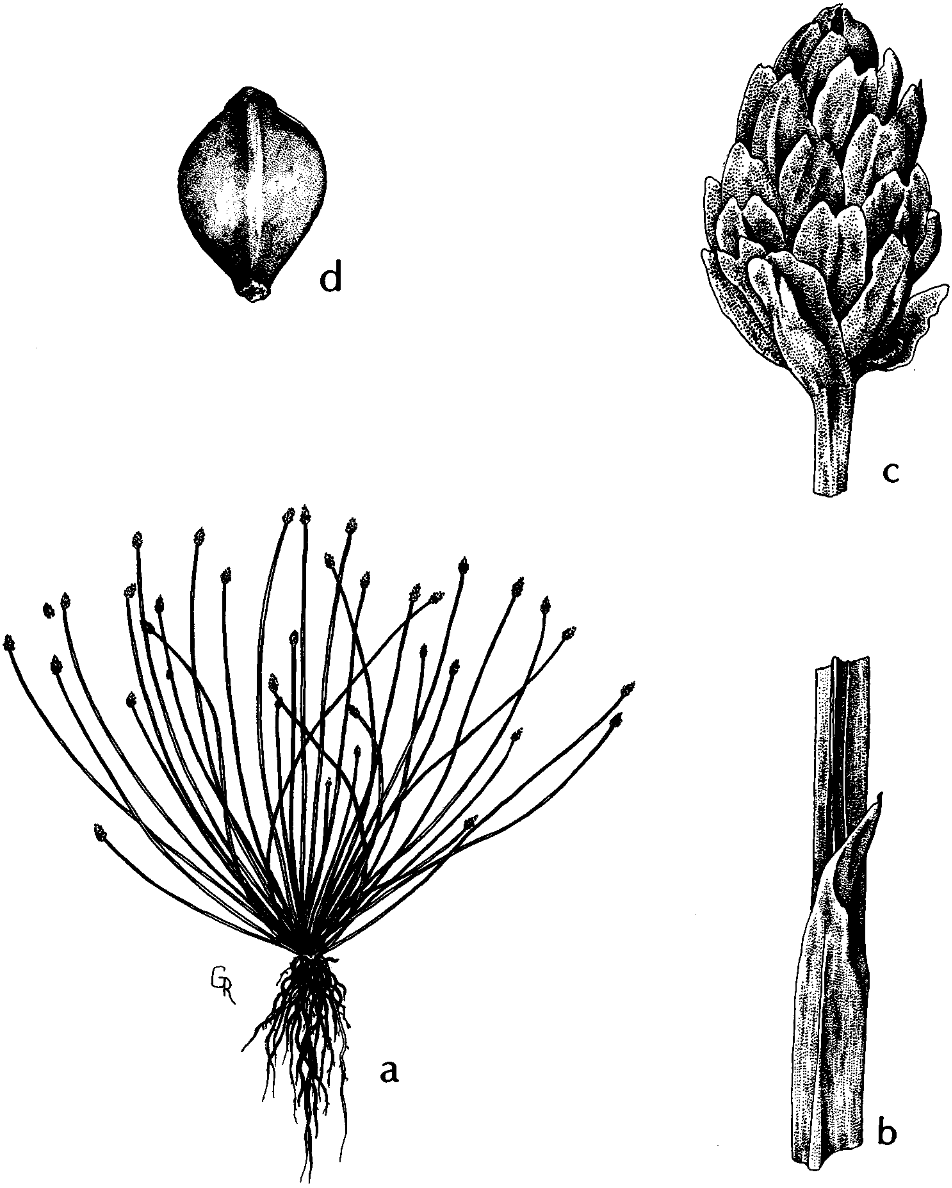

Fig. 195. **Eleocharis nigrescens:** a, habit; b, summit of leaf sheath; c, spike; d, achene.

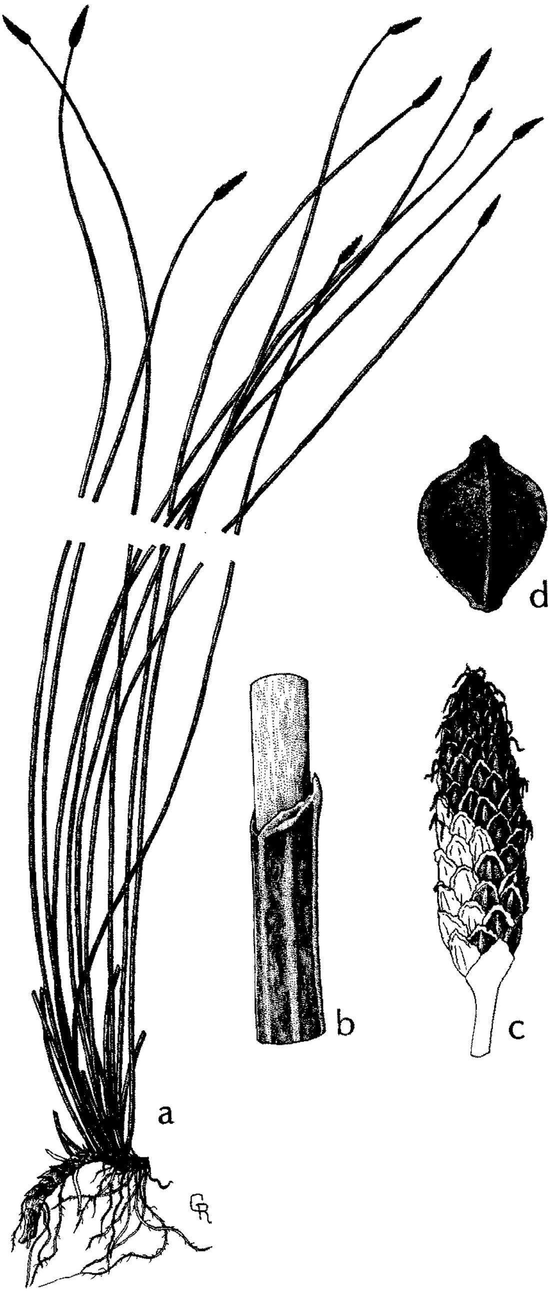

Fig. 196. **Eleocharis tricostata:** a, habit; b, summit of leaf sheath; c, spike; d, achene.

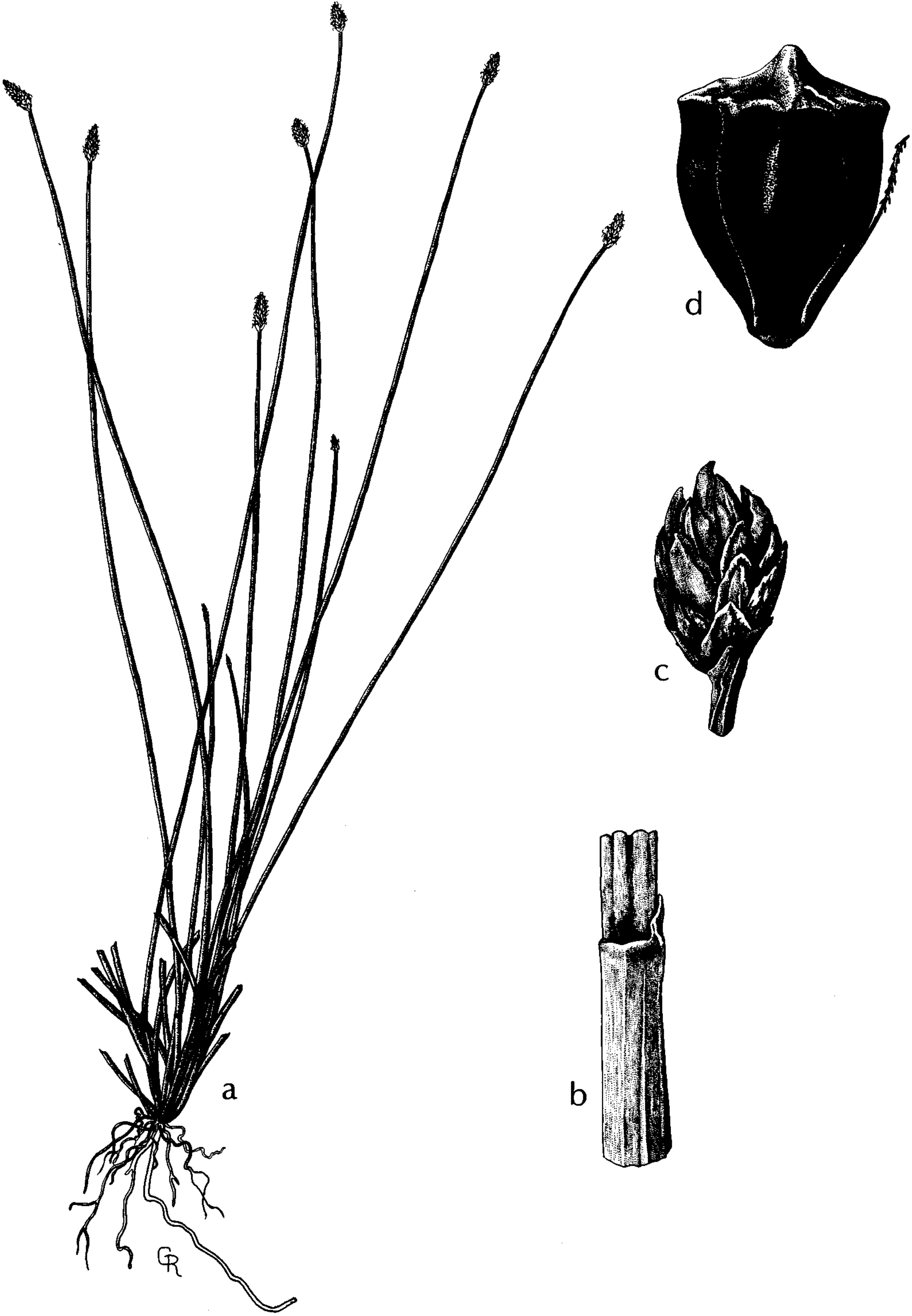

Fig. 197 **Eleocharis melanocarpa:** a, habit; b, summit of leaf sheath; c, spike; d, achene.

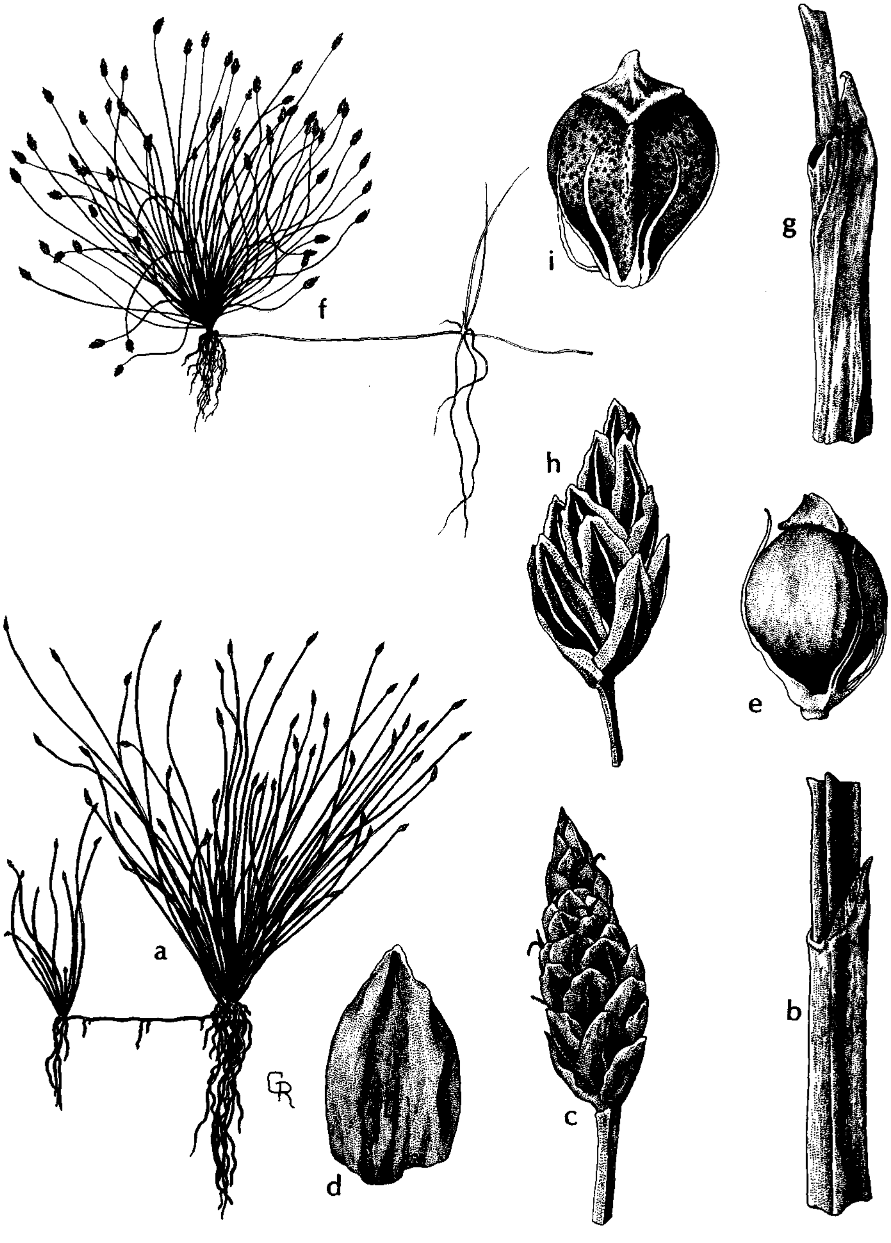

Fig. 198. a–e, **Eleocharis microcarpa:** a, habit; b, summit of leaf sheath; c, spike; d, scale; e, achene; f–i, **Eleocharis minima:** f, habit; g, summit of leaf sheath; h, spike; i, achene.

shorter than the achene body, or very short, or absent. (Incl. *Eleocharis bicolor* Chapm., *E. uncialis* Chapm. ex Small)

Shallow water, shores of lakes, ponds, streams, in swamps. Rare, Ga. and Fla. to Tex. and Calif.; Mex.; trop. Am.

29. Eleocharis microcarpa Torr. Fig. 198

Cespitose annual. Stems finely capillary, erect to reclining, 1–3 dm tall, sometimes proliferating from the spikes. Leaf sheath pinkish to straw-colored basally, apically long-oblique and hyaline. Spikes lanceolate to ovate or oblong, 1.5–5 mm long, many-flowered, often proliferating. Scales ovate, membranous, acute. Achenes trigonous, smooth, narrowly obovate, pearly white to pale greenish gray, 0.5–0.6 mm long; tubercle tiny, conic-apiculate, surmounting the narrowed summit of the achene skullcaplike; bristles unequal, minute to equalling the achene. (*E. brittonii* Svens.; *E. torreyana* Boeckl.; *E. lundellii* Svens.)

Wet sands, peaty-sand or muck, often in shallow water, flatwoods depressions, shores, ditches, swamp margins and clearings. Coastal plain, Conn. to Fla. and Tex.; Tenn. and Ind.; W.I.

30. Eleocharis albida Torr. Fig. 199

Perennial, slenderly rhizomatous and mat-forming. Stems slender-wiry, about 1 mm thick, 1–4 dm tall. Leaf sheaths usually straw-colored or pinkish basally, summit firm, loose, oblique, the outer face triangular-acute. Spike ovoid to ovoid-cylindric, 5–16 mm long, many-flowered. Scales ovate, 2 mm long, with or without a midrib, firm, subcartilaginous medially, the edges stiff-membranous. Achenes trigonous, body 0.8–1 mm long, obpyriform, narrowed below almost to a stipe, light brown to olivaceous, smooth, usually ripening to a rich dark brown; tubercle conic-apiculate; bristles exceeding the achene, finely retrorsely toothed.

Brackish marshes, calcareous pools and shores. Coastal plain, Md. to Fla. w. to Tex.; Mex.; Berm.

31. Eleocharis verrucosa (Svenson) Harms.

Plant with slender reddish purple rhizomes. Stems in small tufts from the rhizomes, finely wiry, 0.2–0.3 mm thick, weakly ascending; leaf sheaths reddish purple, the summits firm-cartilaginous, slightly oblique to truncate, the outer face usually with a small mucro. Spikes lanceolate to narrowly ovoid or narrowly ovoid-cylindric, 3–9 mm long. Scales ovate to obovate, about 2 mm long, texture very firm, dark reddish purple except for flat hyaline margins distally. Achene obovoid, the body 0.6–0.8 mm long, surficially honeycombed reticulate, the pits vertically elongated, transverse walls sometimes warty; ripening through yellow to olive green and iridescent; tubercle depressed-conic; bristles 2–3, short, and easily detached. (*E. tenuis* (Willd.) Schult. var. *verrucosa* (Svens.) Svens.)

Moist to wet sandy-peaty soils, pine flatwoods, muds along streams and sloughs, ditches. S.e. Va.; Ind. to Ark. and Okla.

32. Eleocharis montevidensis Kunth. Fig. 200

Perennial with conspicuous slender reddish rhizomes. Stems wiry, erect, to 4 dm tall, 0.4–1 mm thick. Leaf sheaths reddish, the summits subtruncate, cartilaginous-collarlike, the outer face mucronate. Spikes lanceolate, ovate, oblong, to elliptic-cylindric, 3–14 mm long, many-flowered. Scales oblong to ovate, 2–3 mm long, the backs rounded, subcartilaginous, margins flat and hyaline, apices rounded. Achenes subtrigonous, obovoid, body 0.8–1.2 mm long, dark reddish brown to almost black, punctate-reticulate; tubercle short-conic; bristles equalling or shorter than the achene, retrorsely toothed. (*E. arenicola* Torr.; *E. palmeri* Svens.; *E. montana* of authors, not (HBK.) R. & S.)

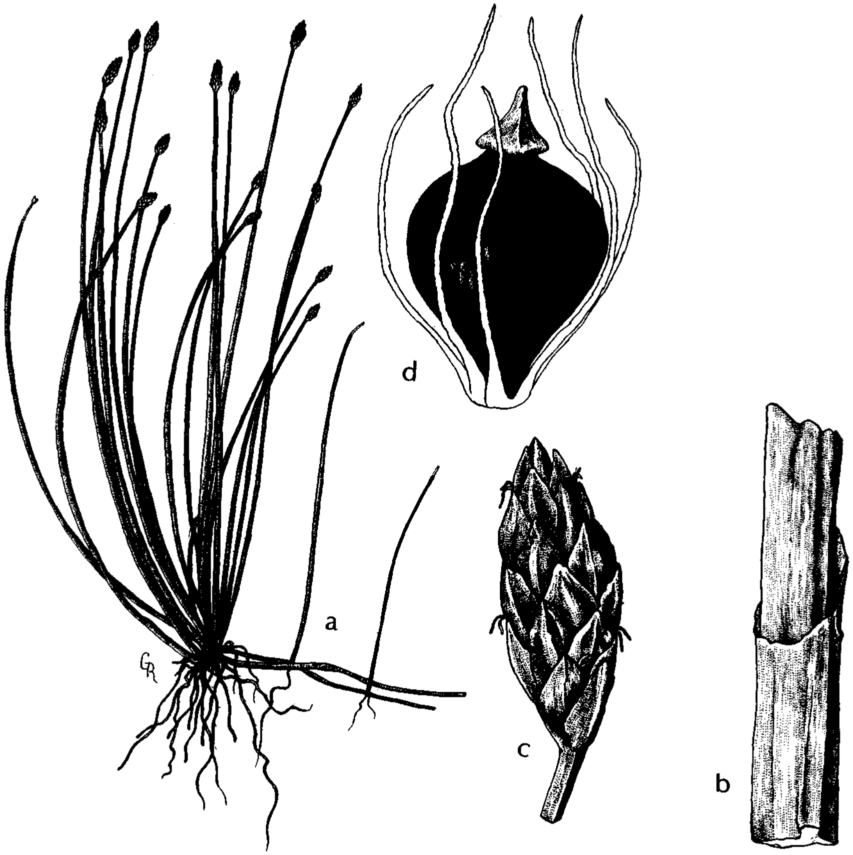

Fig. 199. **Eleocharis albida:** a, habit; b, summit of leaf sheath; c, spike; d, achene.

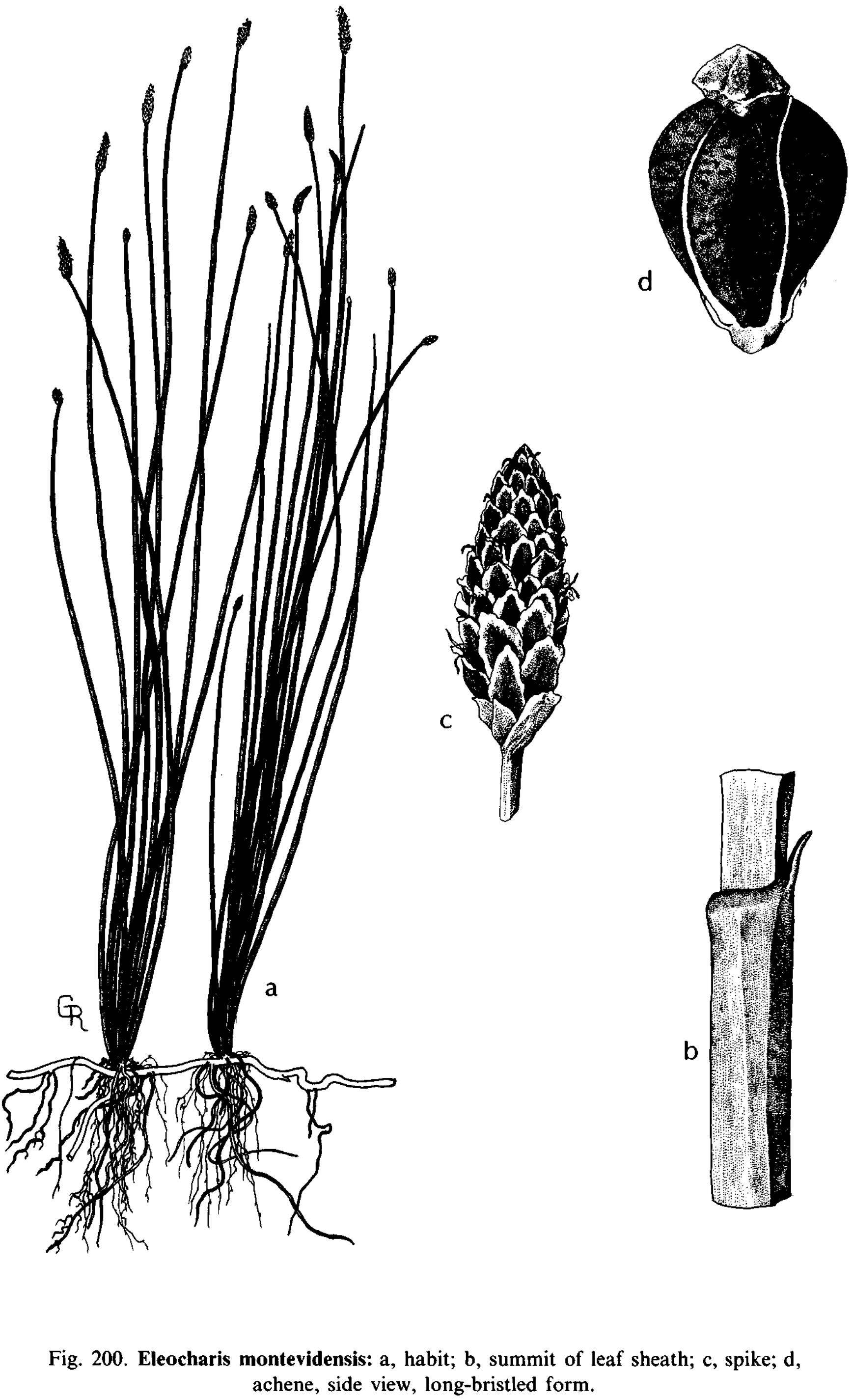

Fig. 200. **Eleocharis montevidensis:** a, habit; b, summit of leaf sheath; c, spike; d, achene, side view, long-bristled form.

Tidal and brackish shores and marshes, marshy clearings and borders of swamps, flatwoods depressions, ditches and drainage canals. Coastal plain, n.e. N.C., Ga. and Fla., w. to Okla., Tex., thence to Calif., Oreg., Idaho; Mex., Guat.; s. Brazil to Argen.

33. **Eleocharis vivipara** Link. Fig. 201

Cespitose perennial with slender rhizomes. Stems wiry, erect to reclining, to 3 dm tall. Summit of the leaf sheath slightly oblique, firm, the outer face broadly triangular at the tip. Spike linear-cylindric to slenderly lanceolate, 3–7 mm long, commonly sterile and proliferating vegetatively. Scales oblong, their apices rounded, the midportion firm and with broad hyaline margins, 1.5–2 mm long. Achenes trigonous, obovate, body 0.6–0.8 mm long, with longitudinal bands on each of the angles, finely reticulate, the cells isodiametric, grayish green and semi-iridescent; tubercle conic-pyramidal; bristles equalling the achene, antrorsely toothed. (*E. curtisii* Small)

Mucky or peaty marshy shores, pools, depressions, ditches, borders of swamps and wet clearings, often in water. Coastal plain, s.e. Va. to Fla.

9. Websteria

Websteria confervoides (Poir.) Hooper. Fig. 202

Slender, submersed perennial aquatic, rooting in mud in shallow to deep water, sometimes in floating mats. Stems capillary, simple to first node, terminated by a small bud with a single bract and growth point; this is potentially an inflorescence but rarely develops; each terminal bud giving rise to a cluster or whorl of from 3–12 branches, each enclosed by a thin, hyaline or membranous sheath at the base. This cluster of branches elongates to 3–25 cm and may give rise to another whorl of branches, etc., the plant thus becoming very diffuse, or at such a point an inflorescence, a solitary spikelet, forms. Spikelet 1 cm long, on a slender stalk 1–several cm long, held above the surface of the water during anthesis. Scales 2, the lower one empty but completely enclosing the second which is 1-flowered, the 2 scales somewhat spreading during anthesis. Stamens 3, all on one side of the slightly compressed ovary, anthers longer than the filaments, about 3 mm long, and included. Style divisions 2, longer than the undivided portion, plumose, exserted. Achene olive or olive brown, obovate, biconvex, apiculate, about 3.2 mm long, indistinctly pitted. Bristles 6–8, longer than the achene, retrorsely barbellate. (*W. submersa* (Sauv.) Britt.; *Scirpus confervoides* Poir. in Lam.)

Lakes and ponds. Fla.; trop. Am.

10. Eriophorum (COTTON-GRASS)

Eriophorum virginicum L.

Rhizomatous perennial. Stems stiffly erect, to 1 m tall or a little more. Leaf blades glabrous, flat, to 3 dm long, 3–4 mm wide, margin finely scabrid; old persistent fibrous leaf bases usually present basally; lower surface of leaf sheath usually purple-spotted. Inflorescence a dense terminal woolly head; foliar bracts subtending the head 2 or 3, unequal, exceeding the head. Spikelets several, short-stalked, crowded. Scales copperish brown, spirally imbricate, several-nerved, ovate, flat, 2–4 mm long, apically blunt, margins scarious, finely ciliate. Achene compressed-trigonous, 3–3.5 mm long, narrowly obovate, style deciduous; bristles numerous, tawny or copper-colored, smooth, about 2 mm long.

Bogs. Nfld. and Que. to Man. and Minn., generally southward to S.C., n.w. and s.e. Ga. (Okefenokee Swamp), and Tenn.

11. Scirpus (BULRUSHES)

Annual or perennial herbs of wet soils or in water. Stems unbranched, triangular, or in

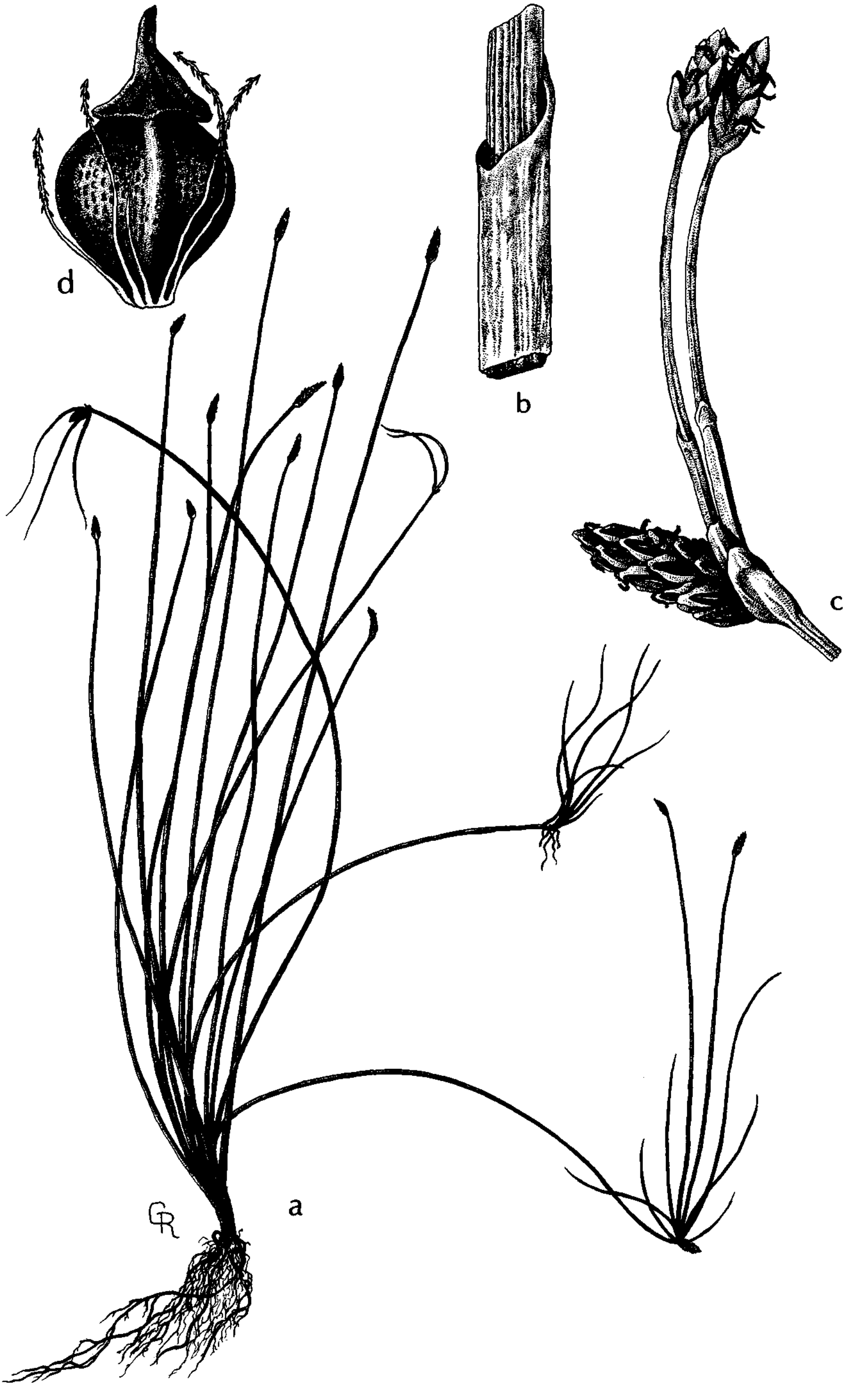

Fig. 201. **Eleocharis vivipara:** a, habit; b, summit of leaf sheath; c, proliferated inflorescence; d, achene.

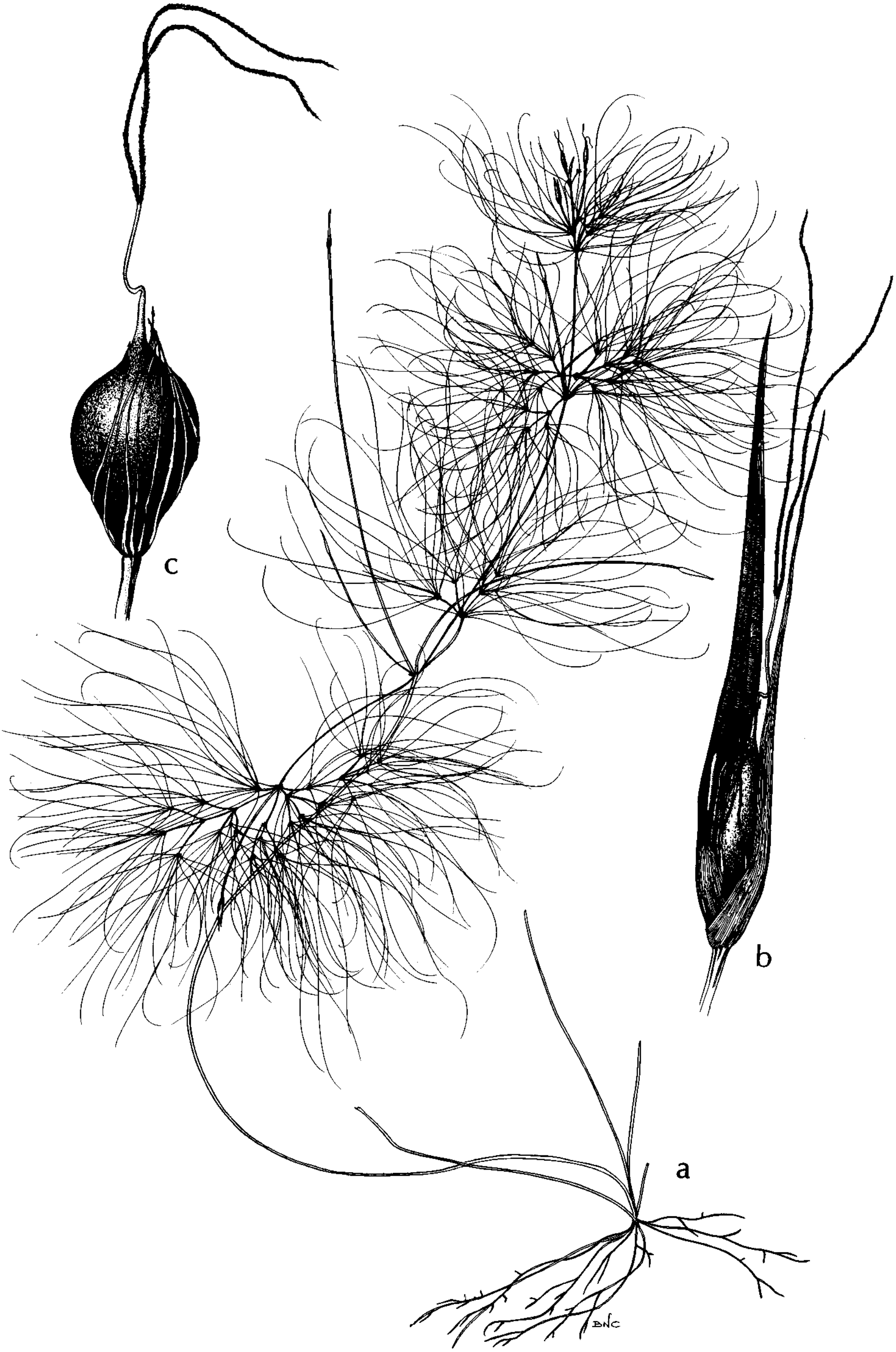

Fig. 202. **Websteria confervoides:** a, habit; b, spikelet; c, achene.

some obscurely triangular to essentially terete. Leaves in some species of bladeless sheaths only. Inflorescences very variable, without subtending bracts, with several leaflike bracts, or with a single bract appearing like a continuation of the stem. Scales of spikelets usually spirally imbricate, usually each subtending a single bisexual flower. Perianth of 1–6 bristles, rarely more or none. Stamens 2–3. Style not or only slightly swollen at base, deciduous as the fruit matures, or if persistent not differentiating as a tubercle; stigmas 2–3. Achenes lenticular, plano-convex, or 3-angled.

1. Involucral bract 1 and appearing as an extension of the stem (occasionally 2 but neither leaflike), the inflorescence thus seemingly lateral.

2. Spikelets all sessile.

3. Plants tufted.

4. Achene trigonous. 1. *S. koilolepis*

4. Achene plano-convex.

5. Perianth bristles none; achene transversely rugose. 2. *S. erismanae*

5. Perianth bristles present; achene smooth or slightly pitted. 3. *S. purshianus*

3. Plants with elongate rhizomes.

6. Rhizomes soft, slender; stems terete; achene 3-angled. 4. *S. subterminalis*

6. Rhizomes hard, stoutish; stems sharply triangular; achene plano-convex.

7. Scales of the spikelet with a prominent awn projecting from the cleft apex; involucral bract 3–12 cm long. 5. *S. pungens*

7. Scales of the spikelet with a short, inconspicuous mucro extending from the nearly entire apex; involucral bract 1–5 cm long. 6. *S. americanus*

2. Spikelets on stalks of varying lengths.

8. Stem sharply triangular. 7. *S. etuberculatus*

8. Stem terete or obscurely triangular near the apex only.

9. Spikelets lance-ovoid, acute; perianth bristles plumose. 8. *S. californicus*

9. Spikelets ovoid, obtuse; perianth bristles retrorsely barbed. 9. *S. validus*

1. Involucral bracts 2–8, leaflike, the inflorescence thus appearing terminal.

10. Spikelets in dense spherical (or somewhat lobed) heads; achene base embedded in a whitish cartilaginous material, this extending as a rim around the edges and extending as a beak at the apex. 10. *S. cubensis*

10. Spikelets not in dense heads, solitary on stalks or in fascicles or glomerules; achene not as above.

11. Spikelet large, 1–3 cm long, or longer, 8–12 mm wide. 11. *S. robustus*

11. Spikelet small, 0.3–1 cm long, 0.5–3.0 mm broad.

12. Perianth bristles long and curly, very much extruded from the spikelet scales and giving the spikelet a markedly woolly appearance. 12. *S. cyperinus*

12. Perianth bristles little if any extruded from the spikelet scales, the spikelets not woolly.

13. Spikelets in tight glomerate clusters.

14. Perianth bristles very crooked, contorted, or curled. 13. *S. polyphyllus*

14. Perianth bristles, if any, straight to slightly curved.

15. Lower leaf sheaths purplish red. 14. *S. expansus*

15. Lower leaf sheaths green. 15. *S. atrovirens*

13. Spikelets not in tight glomerate clusters.

16. Scales boatlike with a prominently arching green-keeled midrib, sides membranous, pale and somewhat suffused with red; achene 3-angled, the faces equal. 16. *S. divaricatus*

16. Scales with a straight, scarcely keeled green midrib, the sides chestnut brown; achene 3-angled, one face flat between the angles, the other faces sloping.

17. Perianth bristles, extended, more than twice the length of the achene. 17. *S. pendulus*

17. Perianth bristles, extended, shorter than or only slightly exceeding the achene. 18. *S. lineatus*

1. Scirpus koilolepis (Steud.) Gl.

Cespitose annual. Stems 4–20 cm tall, minutely striate, ascending or arching. Leaf blades near the base and mostly shorter than the stems, setaceous. Involucral bract appearing as a continuation of the stem, to 3 cm long. Spikelet usually solitary (sometimes two), sessile, 3–7 mm long, narrowly ovoid, straw-colored, pebbly looking because the plump achenes fill out the scales. Scales keeled, the sides membranous. Stigmas 3. Achene trigonous, 1.3–1.5 mm long, globose or globose-oblong in outline, between the angles flat or slightly convex, surface brownish, with numerous vertical lines of very tiny pits and covered with a thin whitish waxy bloom; perianth bristles none. (*S. carinatus* (H. & A.) Gray)

Frequent in moist sands of cultivated areas, in depressions and seepage areas. Cen. N.C. to Fla. Panhandle, Ala., Tenn., to Okla. and Tex.; Calif.

Scirpus molestus M. C. Johnst., of Ark., La. and Tex., is apparently similar. Spikelets usually 2–3, less commonly 1. The achene is smaller, 0.8–0.9 mm long, with a pinkish brownish surface, similarly pitted, but with a thick whitish waxy bloom.

2. **Scirpus erismanae** Schuyler. Fig. 203

Cespitose with tightly matted soft slender rhizomes. Stems to 30 cm tall, subterete, with small leaves at the base, the blades to 20 cm long, usually much shorter. Involucral bract appearing as a continuation of the stem, 1–20 cm long. Spikelets sessile, 1–10 in a cluster, ovate to lance-ovate, 2–3 mm wide and to 2.5 cm long. Stigmas 2. Scales reddish brown distally. Achene broadly obovate, nearly plano-convex, but bulged on ventral surface, black at maturity and transversely rugose, 1.2–1.6 mm long; perianth bristles none.

Wet sands and peats or peaty sands of pond shores, pools in swampy woodlands, flatwoods depressions. S.C.; s.w. Ga., Fla. Panhandle to cen. pen. Fla.

S. hallii Gray., apparently very similar, is known in our range from one locality in Georgia. It differs in having yellow brown spikelet scales and achenes which are concave on the ventral surface.

3. **Scirpus purshianus** Fern.

Cespitose annual, stems terete or nearly so, striate. Leaves of bladeless sheaths or rarely with blades to 1 cm long. Inflorescence a cluster of sessile spikelets subtended by 1 bract appearing as a continuation of the stem, 5–10 cm long. Scales yellowish, more or less suffused with brownish red, midrib green, apically mucronate. Stigmas 2–3. Achenes yellow to black, glabrous, pitted or papillose, unequally plano-convex, bulged on both sides, obovoid, 1.4–1.8 mm long. Perianth bristles 5–6, retrorsely barbed, unequal, some longer than achene. (*S. debilis* Pursh)

Marshes, shores, bogs, swamps, shallow pools. Maine to Minn., s. to Ga., Ala., Miss., Tenn., Ky., W.Va.

4. **Scirpus subterminalis** Torr. SWAYING-RUSH.

Submersed aquatic perennial with very slender soft rhizomes. Stems 3–6 dm tall, terete, very slender, nodose. Leaves nodose, long-filiform, to 1 mm wide. Involucral bract 1, erect, 3–20 mm long. Spikelet single, straw-colored, 4–5 mm long. Stigmas 3. Achene 3-angled, obovoid, olive brown, abruptly short-beaked, about 2.5 mm long. Perianth bristles 6, retrorsely minutely barbed, unequal, the longest scarcely exceeding the achene.

In ponds, streams, pools, quaking bogs. Nfld. to Ont., s. to Ga., Mich., n. Ill. and Ind., s. Mo.

5. **Scirpus pungens** Vahl. SWORD-GRASS, THREE-SQUARE BULRUSH. Fig. 204

Perennial by extensive, branching, reddish rhizomes bearing prominently veined leaf-sheaths which become fibrous in age. Fibrous roots red, arising from the lower surface of the rhizome. Upright stem to 1 m tall, arising from the nodes of the rhizome, sharply triangular, lowermost nodes (usually underground) producing membranous leaf-sheaths; 1–3 nodes above the soil-level with 2–4 flat leaf-blades to 2 dm long. Bract of the inflorescence appearing as a continuation of the stem, deeply grooved immediately above the inflorescence and becoming plane on all three surfaces, 3–12 cm long, usually much surpassing the inflorescence. Spikelets 1–5, sessile, 5–20 mm long and to 4 mm

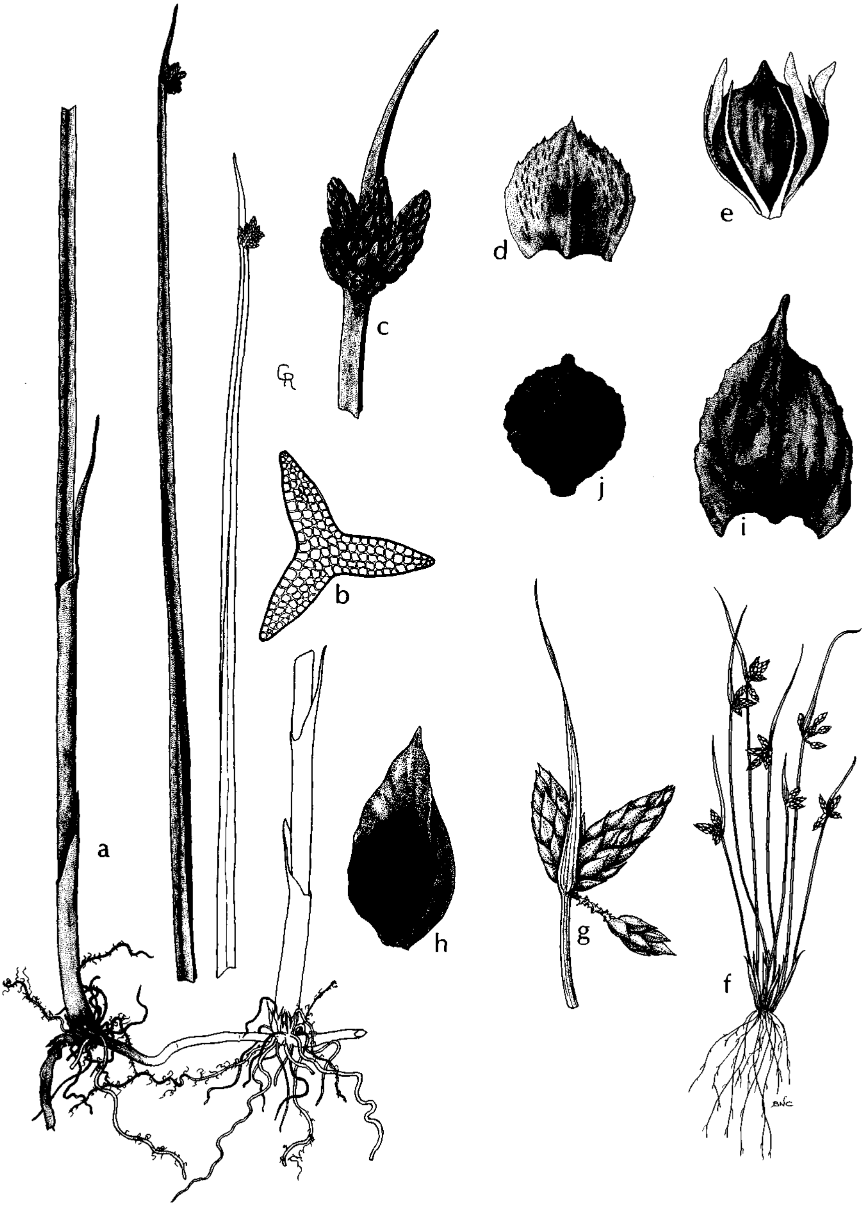

Fig. 203. a–e, **Scirpus americanus:** a, habit; b, cross section of stem; c, inflorescence; d, scale; e, achene; f–j, **Scirpus erismanae:** f, habit; g, inflorescence; h, achene in scale; i, scale spread out; j, achene.

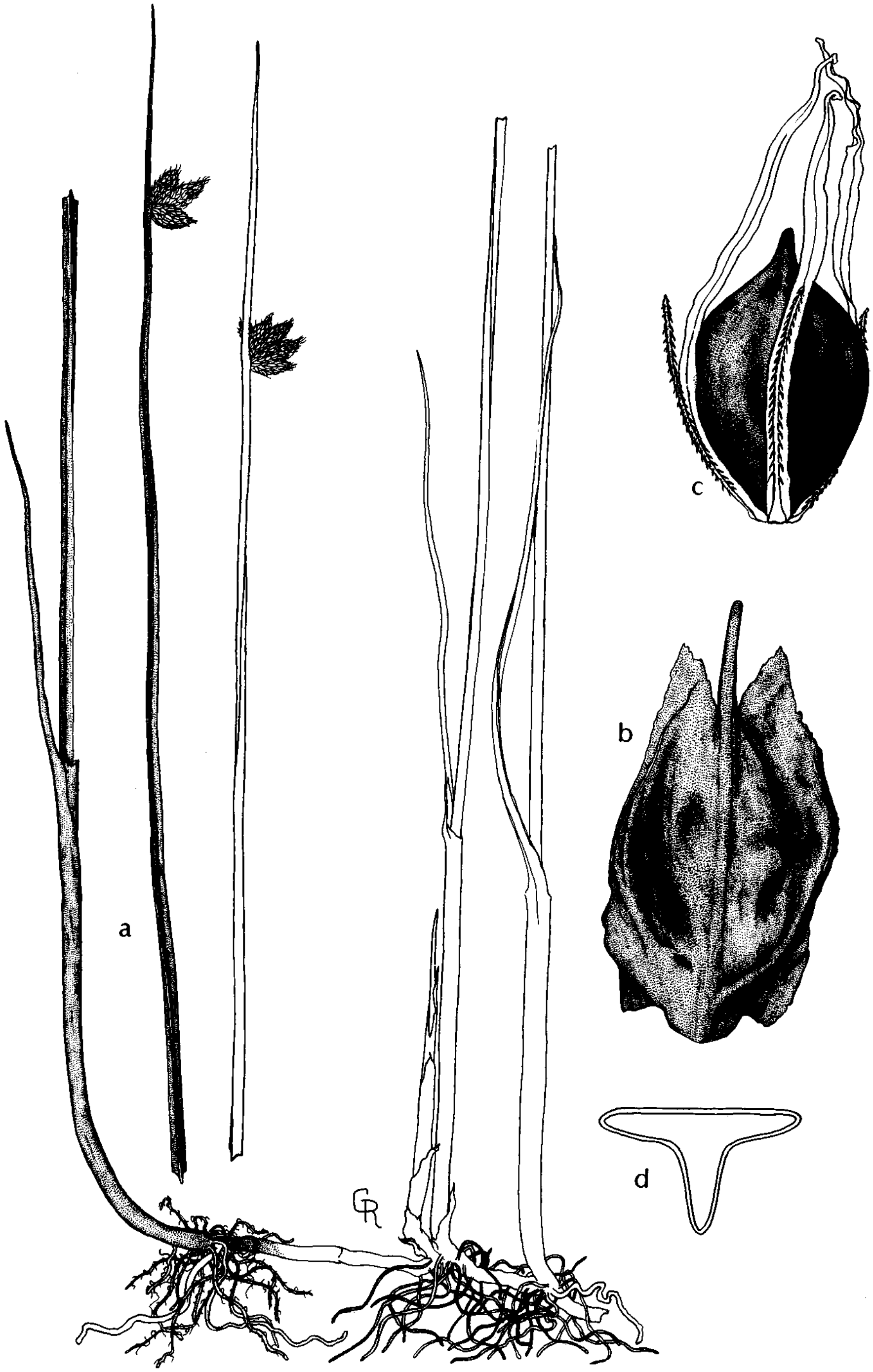

Fig. 204. **Scirpus pungens:** a, habit; b, scale; c, achene; d, cross-sectional outline of stem.

wide, ovoid to lance-ovoid. Scales chestnut brown, streaked and variously spotted with red brown, 4–5 mm long, 3 mm wide, with a very prominent midrib which is extended as a stout mucro from between acute lobes of apex of scale, slightly exceeding ends of lobes, edges of scales becoming lacerate in age. Achene about 3 mm long, 2 mm wide, obovate, plano-convex, olive at base shading to brown at apex, apiculate. Perianth bristles usually 4, two at the edges and two shorter ones by the convex face of achene, retrorsely barbed, longest about the length of achene.

Wet, usually sandy, fresh to brackish or saline shores and marshes. Nfld. to Fla. w. to Pacific, southward to S.Am.; Eurasia. (*S. americanus* of authors, not Pers.)

6. Scirpus americanus Pers. Fig. 203

Similar to *S. americanus.* Involucral bract usually shorter, 1–5 cm long, and broader at the base, i.e., with more taper. Spikelet scales with a short mucro seated in a small **V** notch.

Of sporadic occurrence, brackish to saline shores and marshes. N.S. and N.H. to Fla. Scattered saline stations in the U.S. westward to the Pacific; W.I., S.Am.

7. Scirpus etuberculatus (Steud.) Kuntze. Fig. 205

Perennial by smooth, red stolons, with short veiny sheaths; nodes producing upright stems becoming swollen. Roots fibrous in tufts from nodes of the stolons and from bases of upright stems. Stems 1–1.5 m tall, obscurely 3-angled below, sharply so above. Leaves mostly basal, channeled, nearly as long as the stem, 2–12 mm wide at base, tapering to a narrow but blunt apex. Bracts of the inflorescence one, or if inflorescence branched, another bract at the base of the branch, to 20 cm long and 8 mm wide, sharply folded with the base of the inflorescence in the fold. Spikelets several on slender, arching stalks; 1–2.5 cm long, 5–7 mm wide, lance-ovoid. Scales about 6 mm long, with broad green midrib and broad yellowish to brownish hyaline margins, midrib thickened distally into a stout, subulate mucro. Achene olive, about 3 mm long, 3-angled, one face flat, apiculate. Perianth bristles 4–6, with spreading hairs above, usually longer than the achene.

Ponds, fresh to brackish marshes, sometimes submersed in streams. Coastal plain, Del. to n. Fla., w. to La., n. to Mo.

8. Scirpus californicus (C. Meyer) Steud. GIANT BULRUSH. Fig. 206

Coarse, tall rhizomatous perennial. Rhizome knotty, 8–10 mm in diameter. Stems obtusely 3-angled, 1–3 m tall, dark green, smooth. Bract of the involucre 1.8–7 cm long, usually shorter than the inflorescence and appearing as a continuation of the stem. Inflorescence decompound, usually with a number of drooping branches of varying lengths bearing irregular clusters of spikelets, altogether with up to about 150 spikelets. Stalks of the inflorescence smooth. Spikelets lance-ovoid, 6–11 mm long, acute, many-flowered, chestnut brown. Scales about 3 mm long, ovate to obovate, mucronate. Achene plano-convex or biconvex, obovate, 2 mm long, apiculate, gray or grayish brown, paler below, smooth. Perianth bristles 2–4, flat, reddish-brown, fimbriate or plumose.

Of sporadic occurrence in our range, often in shallow water, marshes, pools, drainage canals and ditches, shores. Gulf states to s. Calif.; trop. Am.

9. Scirpus validus Vahl. GREAT or SOFT-STEM BULRUSH. Fig. 206

Coarse, tall rhizomatous perennial. Rhizome knotty, brown, 8–10 mm in diameter, covered by overlapping veiny sheaths which break down into fibers. Stems terete or very obscurely 3-angled, spongy, to 3 m tall, 0.3–2 cm thick at base. Leaves reduced to membranous sheaths at base of stems, usually loose and open with an oblique border. Bract of inflorescence single, terete, 0.7–7 cm long, appearing as a continuation of the stem. Inflorescence decompound. Spikelets in irregular clusters on stalks of varying lengths, some obtuse, chestnut brown, 6–10 mm long, 3–4 mm wide at base. Scales

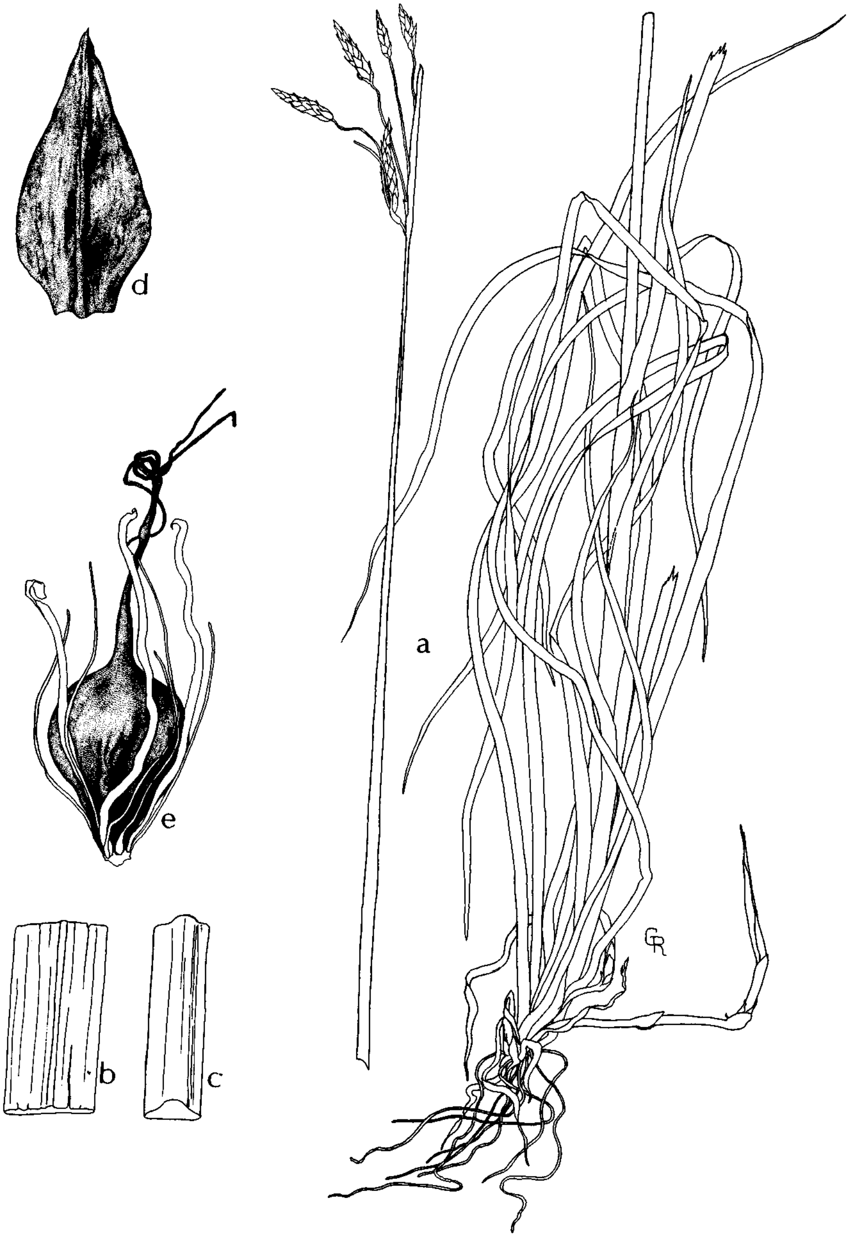

Fig. 205. **Scirpus etuberculatus:** a, habit; b, section of submersed leaf; c, section of emersed leaf; d, scale; e, achene.

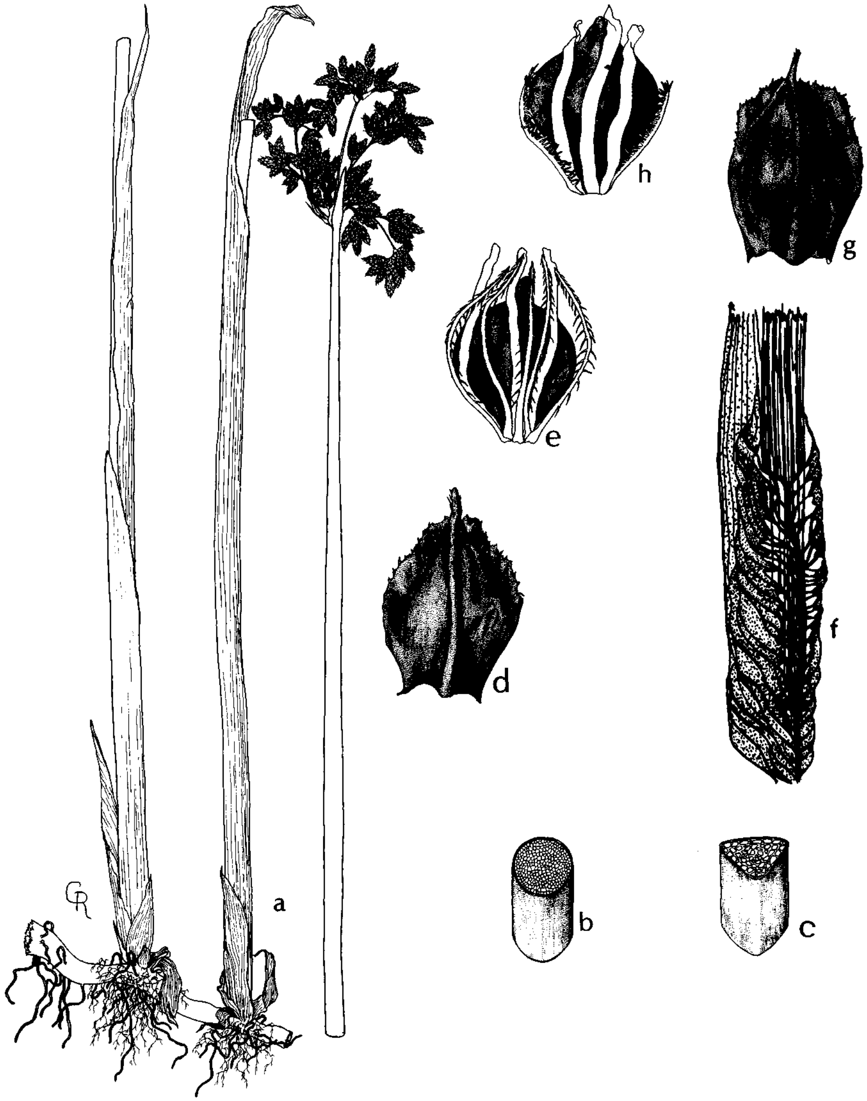

Fig. 206. **Scirpus validus:** a, habit; b, section of midstem; c, section of upper stem; d, scale; e, achene; f, summit of leaf sheath; g–h, **Scirpus californicus:** g, scale; h, achene.

broadly ovate, 2.5–3 mm long, about 2 mm wide, mucronate. Achene gray, obovoid, biconvex but bulged on each face toward the apex, abruptly short-apiculate, surface smooth, 1.5–2 mm wide, 2 mm long. Perianth bristles 4–6, longer than the achene, flattened, retrorsely barbed.

Marshes, streams, ponds, commonly in shallow water. Nfld. to Alaska, s. to Fla., westward to the Pacific, s. to S.Am.

Scirpus *acutus* Muhl., apparently of rare occurrence in our range (N.C., Va., Tenn.) but of wide distribution, is very similar.

10. Scirpus cubensis Poepp. & Kunth in Kunth.

Perennial herb with soft and slender reddish rhizomes. Stems slender, triangular, to 1 m tall, often much shorter. Leaves all near the base, elongate, some or all exceeding the inflorescence. Bracts of the inflorescence 2–6, flat, leaflike, in a loose spiral, or tightly appressed, the lowermost longest. Inflorescence of one to several dense, spherical heads, 1–2 cm in diameter, if one, sessile, others if present on stalks of varying lengths; entire inflorescence superficially resembling species of *Cyperus*. Scales about 3 mm long, brown-hyaline, with a raised keellike midrib which extends beyond the rounded-obtuse apex of the scale as a stout, outwardly-curved mucro. Achene lenticular, elongate-elliptic, apiculate, about 3 mm long and 1–1.2 mm wide, base and apex enclosed in a white cartilaginous material of a completely different texture from that of the olive, finely pitted surface of the achene proper, a small wirelike border of the same material edges the achene and extends beyond it as an apiculation. Perianth bristles none.

Commonly in floating mats of vegetation and in sandy to peaty fresh (to brackish?) shores. Fla. to Tex.; trop. Am.; Afr.

11. Scirpus robustus Pursh. SALT-MARSH BULRUSH.

Rhizomatous perennial; rhizome unbranched, to 5 mm thick, firm, dark brown or black, sheaths at the nodes short, becoming fibrous in age; nodes producing upright stems becoming greatly swollen. Stem sharply trigonous, to 1 m tall, lower nodes bearing acuminate sheaths; upper nodes producing elongate leaves to 6 dm long and 1 cm wide. Involucral bracts leaflike, outer one to 3 dm long, others gradually reduced upwardly. Inflorescence of 1–5 (or many) large, ovoid to oblong spikelets, 1–3 (–6) cm long and to 1 cm wide; sessile or on stalks of varying lengths or in stalked clusters. Scales brown or reddish brown, short-pubescent, and with a prominent darker brown midrib bordered with a pale stripe on each side, prolonged as a subulate outwardly curved mucro from the notched apex. Stigmas 2–3. Achene shining, brown, marked with very minute pits, obovoid, mostly plano-convex, 3–3.5 mm long, 2–2.5 mm wide, with a short blunt apiculation and tapering to a narrow base. Perianth bristles none or 3–4, retrorsely finely barbed, mostly not as long as the achene, deciduous at maturity (so easily detached as to be difficult to observe). (*S. maritimus* L. var. *macrostachys* Michx.)

Brackish to saline coastal marshes. Widely distributed in N.Am.; trop. Am.

12. Scirpus cyperinus (L.) Kunth. Fig. 207

Coarse herb perennating by very long-leaved basal offshoots. Flowering stem obtusely triangular, rounded on the faces, strigose on the angles, 1–2 m tall, leafy to the top, internodes long. Leaves of the flowering stem with blades to 8 dm long, 1.5–2 cm broad, channelled and folded at tip, roughly scabrous on margins. Involucral bracts 2–3, leaflike, lowermost longer than others, all brown at base and folded at tip, each ray of the inflorescence also subtended by a narrow brown bract, these decreasing in size upwardly. Inflorescence with several long, flexuous to drooping stalks to as much as 15 cm long, usually with secondary and even tertiary stalks; the uppermost stalks terminated by a single spikelet or by a cluster. From about 200–500 spikelets in an inflorescence. Spikelets ovoid, 3–5 mm long, about 3 mm wide at base. Scales reddish brown, glabrous, ovate-elliptic, broadly acute at apex. Achenes elliptical, 3-angled with one face flat, apiculate, whitish to pale tan, surface smooth. Perianth bristles 6, very long and

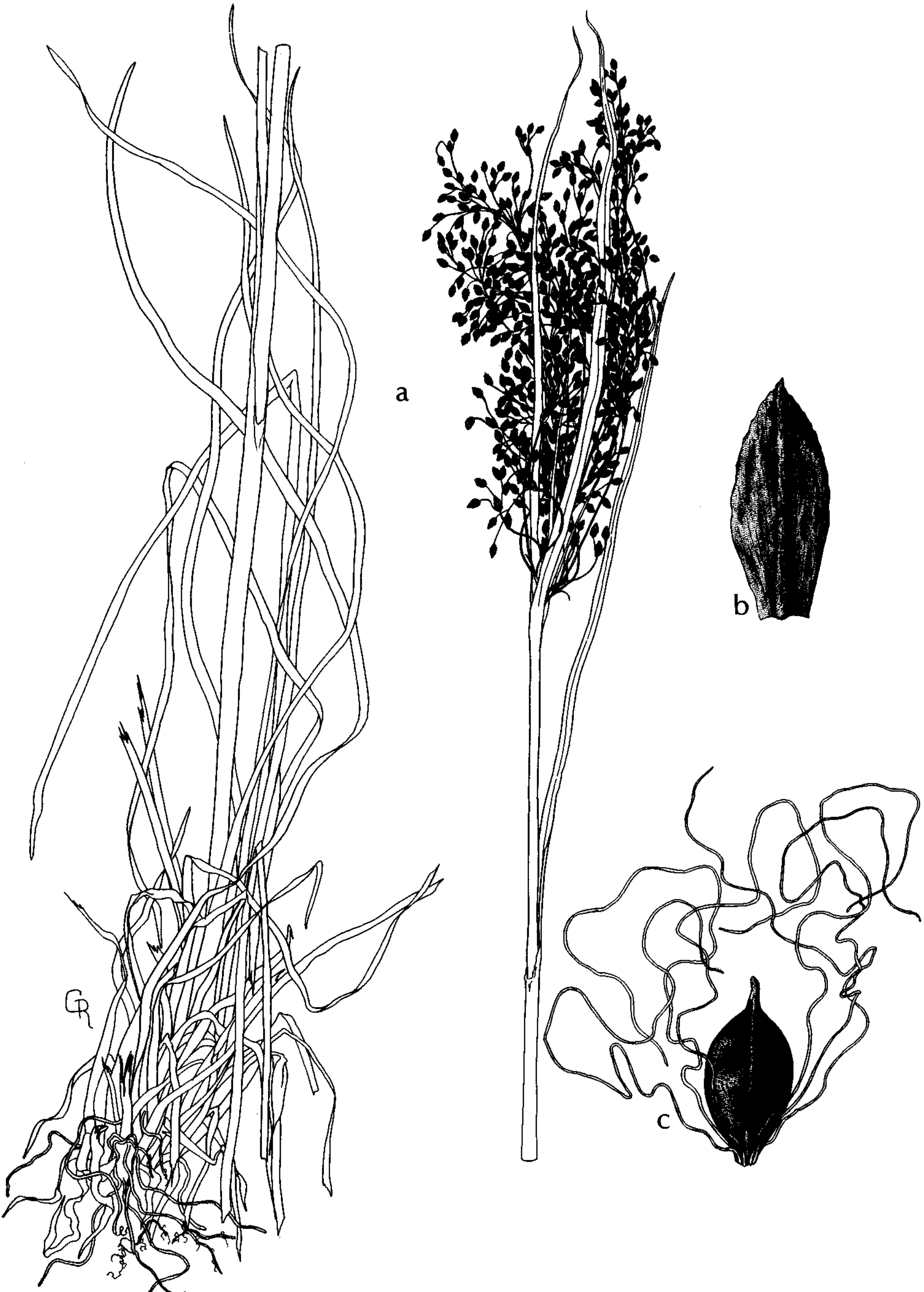

Fig. 207. **Scirpus cyperinus:** a, habit; b, scale; c, achene.

exserted from the scale, the spikelet thus appearing woolly. (*S. eriophorum* Michx.; *S. rubricosus* Fern.)

Marshes, meadows, cypress and gum swamps and ponds, boggy places, swales. Nfld. to Sask., s. to Fla., Okla., and e. Tex.

13. Scirpus polyphyllus Vahl.

Perennial from short, thick rhizomes. Stems ribbed, with 10–20 leaves not much reduced upward; infrequently with axillary bulblets. Leaves to 2 dm long, 4–9 mm wide, ventral surface of sheath purple spotted. Inflorescences branched, open or densely clustered. Involucral bracts numerous, the largest bladelike. Spikelets sessile in glomerules, ovate, 3–4 mm long, 2–3 mm wide. Scales reddish, the midrib green, about as long as broad, mucronate. Achenes yellowish, 1–1.3 mm long, obovate, somewhat 3-angled, one face flat, the others sloping to a broadly obtuse angle. Bristles 6, to over twice as long as the achenes when extended, contorted, retrorsely barbed above the middle.

Stream banks, swamps, marshes. Mass. to Ill., piedmont and mountains southward to Ga., Ala.

14. Scirpus expansus Fern.

Similar to *S. atrovirens.* Spreading perennial with long reddish rhizomes having conspicuous nodes and internodes. Stems scabrous for 1–5 cm at summit, obtusely angled. Leaf sheaths with short cross partitions or thickenings, the lower ones red-tinged. Involucral bracts 3–8, leaflike, the lowest usually over-topping the inflorescence. Inflorescence decompound, the stalks relatively stiff and branching at acute angles. Spikelets ovate, 2–6 mm long, with a broad green central portion and membranous black-dotted sides. Achenes 1–1.6 mm long, 3-angled, one face flat, the other two rising to an obtuse angle. Bristles 3 or 6, shorter than to about 1½ times as long as the achenes, retrorsely barbed to the base.

Marshes, wet meadows, swamps, stream banks, spring-heads. Maine to Mich., s. to Ga.

15. Scirpus atrovirens Willd. Fig. 208

Perennial from short, tough fibrous rhizomes. Stems 3–6 mm thick, obscurely triangular above, with 4–9 leaves. Leaf blades and sheaths nearly smooth, sometimes with short cross-partitions or thickenings. Involucral bracts leaflike, shorter than to exceeding the inflorescence. Inflorescence decompound, stalks branching at widely divergent angles and frequently with axillary bulblets present. Spikelets glomerate, 50–120 in all, greenish black, ovate, 2–4 mm long, 1–2 mm wide. Scales ovate, about 2 mm long, with a relatively narrow green midrib extending beyond the tip as a mucro. Achenes elliptic, about 1 mm long, 3-angled, one face flat, the other two rising to a broadly obtuse angle. Bristles several, about twice as long as the achenes, retrorsely barbed near the tip, sometimes absent. (Includes *S. atrovirens* var. *georgianus* (Harp.) Fern.; *S. georgianus* Harper)

Wet meadows, marshes, ditches. P.E.I. s. to Ga., w. to Tex. and Nebr.

16. Scirpus divaricatus Ell.

Perennial by basal offshoots from the lowermost, subterranean nodes. Roots spongy with many fibrous branches, yellowish or light straw color. Stems slender; often weak and reclining, 0.5–1.5 m tall, obtusely 3-angled, smooth, leafy to the inflorescence. Leaves soft, elongate-linear, to 3 dm long, 4–10 mm wide, lightly scabrous on margins and midrib; axillary bulblets often present. Bracts of the inflorescence leaflike, 4–10 cm long, 2–5 mm wide. Inflorescence decompound, widely spreading, the axis very slender and flexuous, the ultimate branch with a sessile spikelet and several pedicellate ones. Spikelets lanceolate to cylindric, 3–6 mm long, about 2 mm wide, somewhat expanded and open so that the achene is exposed at maturity. Scales about 1.5 mm long, ovate, strongly incurved-keeled, centrally with broad green portion, the margins hyaline.

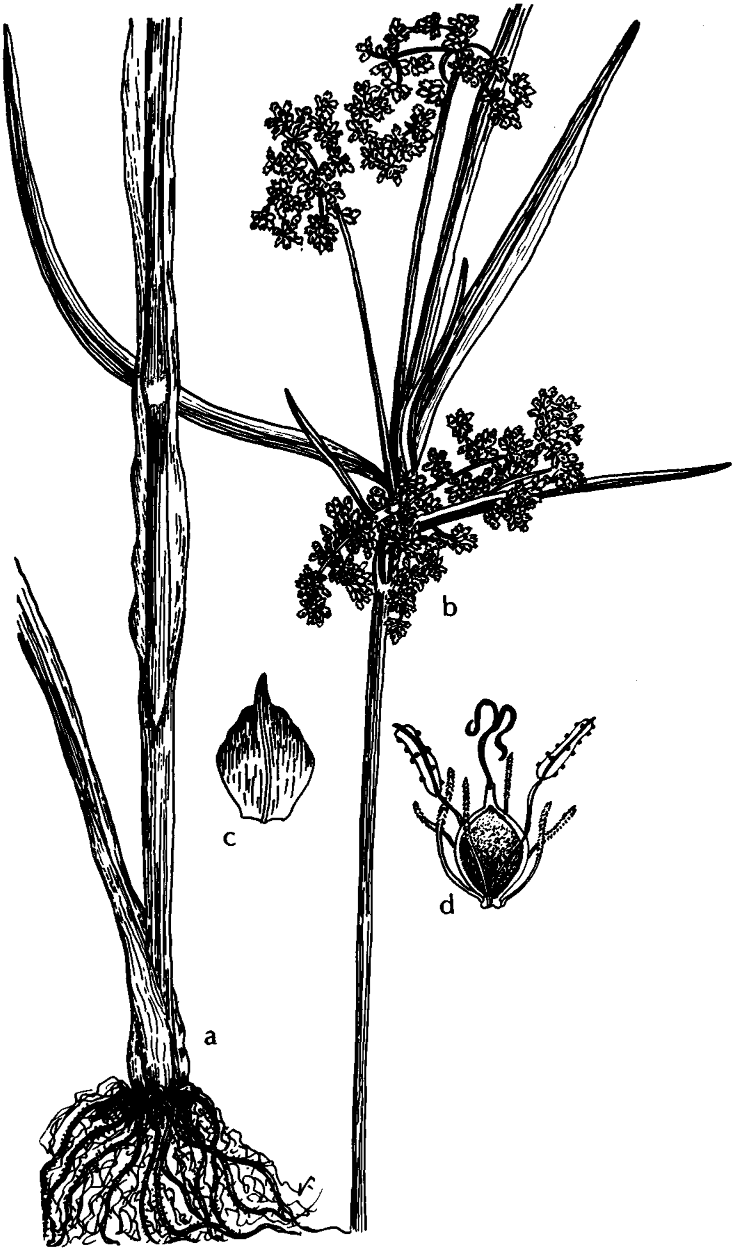

Fig. 208. **Scirpus atrovirens:** a, base of plant; b, inflorescence; c, scale; d, achene. (From Correll and Correll)

Achene sharply trigonous with concave faces and wirelike angles, broadly ellipsoid, surface smooth or very minutely pitted, white to pale tan, about 1 mm long. Perianth bristles 3–6, slender, crinkly, equalling the achene or nearly so.

Low wet woods and swamps, often in shallow water. Coastal plain, Va. to Fla., w. to La., thence to Mo.

17. Scirpus pendulus Muhl. Fig. 209

Perennial from short, thick rhizomes. Stem rigid and erect, obtusely angled, remotely 5–10-leaved with long internodes. Leaves 3–8 mm wide, sheaths ventrally purple spotted. Inflorescence decompound (sometimes with a lateral below the terminal); involucral bracts numerous, the largest leaflike. Ultimate branches bearing a sessile spikelet and several pedicellate ones. Spikelets oblong-cylindric, 5–10 mm long, 2–3.5 mm wide. Scales ovate, midrib green, extending somewhat beyond the tip, the sides reddish brown. Achenes brown, obscurely 3-angled, one face flat, the other two rising to an obtuse angle, ellipsoid to obovoid, beaked. Bristles 6, smooth, curling, when extended longer than the achene. (*S. lineatus* of recent authors not Michx.)

Marshes, stream banks, bogs, ditches, wet woods. Maine to Colo., southward to Ga. and n. Mex.; n.e. Fla.; Oreg., Calif., N.Mex.

18. Scirpus lineatus Michx. Fig. 209

Similar to *S. pendulus*. Stems at maturity usually lax and reclining with inflorescences lapping over to, or nearly to, the ground; often proliferating vegetatively from the inflorescence. Usually with 1–2 lateral inflorescences. Leaves thin and wider, to 15 mm. Perianth bristles, extended, equalling to slightly exceeding the achene. (*S. fontinalis* Harper)

Along wooded streams, wet woodlands, swamp forests, often in shallow water. Coastal plain, s.e. Va. to cen. Fla. and La.

12. Fuirena (UMBRELLA-GRASSES)

Annual or perennial herbs. Stems obtusely triangular. Lowermost leaf sheaths bladeless, or all sheaths bladeless. Spikelets many-flowered, flowers closely spirally imbricate, mostly in terminal umbels, sometimes with 1–3 subterminal axillary umbels, or terminal and solitary. Scales of the spikelet acicular-awned or mucronate. Flowers bisexual. Perianth (in ours) of 3 scales with expanded blades and stipitate-clawed bases *and* 3 alternating bristles. Stamens 3. Style 3-cleft at the summit. Achene strongly 3-angled, stipitate, apiculate at the summit.

1. Plant with conspicuously elongate rhizomes, flowering stems arising singly and relatively well separated from each other from the rhizomes; leaf sheaths all bladeless or only the uppermost with short blades; mucros or awns of the spikelet scales not spreading or arched-recurved thus the spikelet not appearing burlike. 1. *F. scirpoidea*
1. Plants with soft, tufted bases or cespitose and with short rhizomes, if rhizomatous the flowering stems arising close together from the rhizomes; lowermost leaf sheaths bladeless; awns of spikelet scales spreading or arched-recurved giving the spikelet a burlike appearance.
  2. Perianth bristles no longer than the stipe of the achene, usually shorter, without barbs or weakly, usually upwardly, barbed; tips of blades of perianth scales blunt or barely pointed (sometimes inrolled at the very tip thus appearing apiculate). 2. *F. breviseta*
  2. Perianth bristles reaching ¾ the length of the body of the achene to exceeding the achene, markedly downwardly barbed.
    3. The perianth bristles usually reaching ¾ of the length of the achene body. 3. *F. squarrosa*
    3. The perianth bristles reaching the summit of the achene, usually exceeding it.
      4. Tips of perianth scales acuminate, usually incurved, without a bristle that arises subapically. 4. *F. pumila*
      4. Tip of perianth scale obtuse, truncate, more frequently retuse, with a strongly downwardly barbed bristle that arises subapically. 5. *F. simplex*

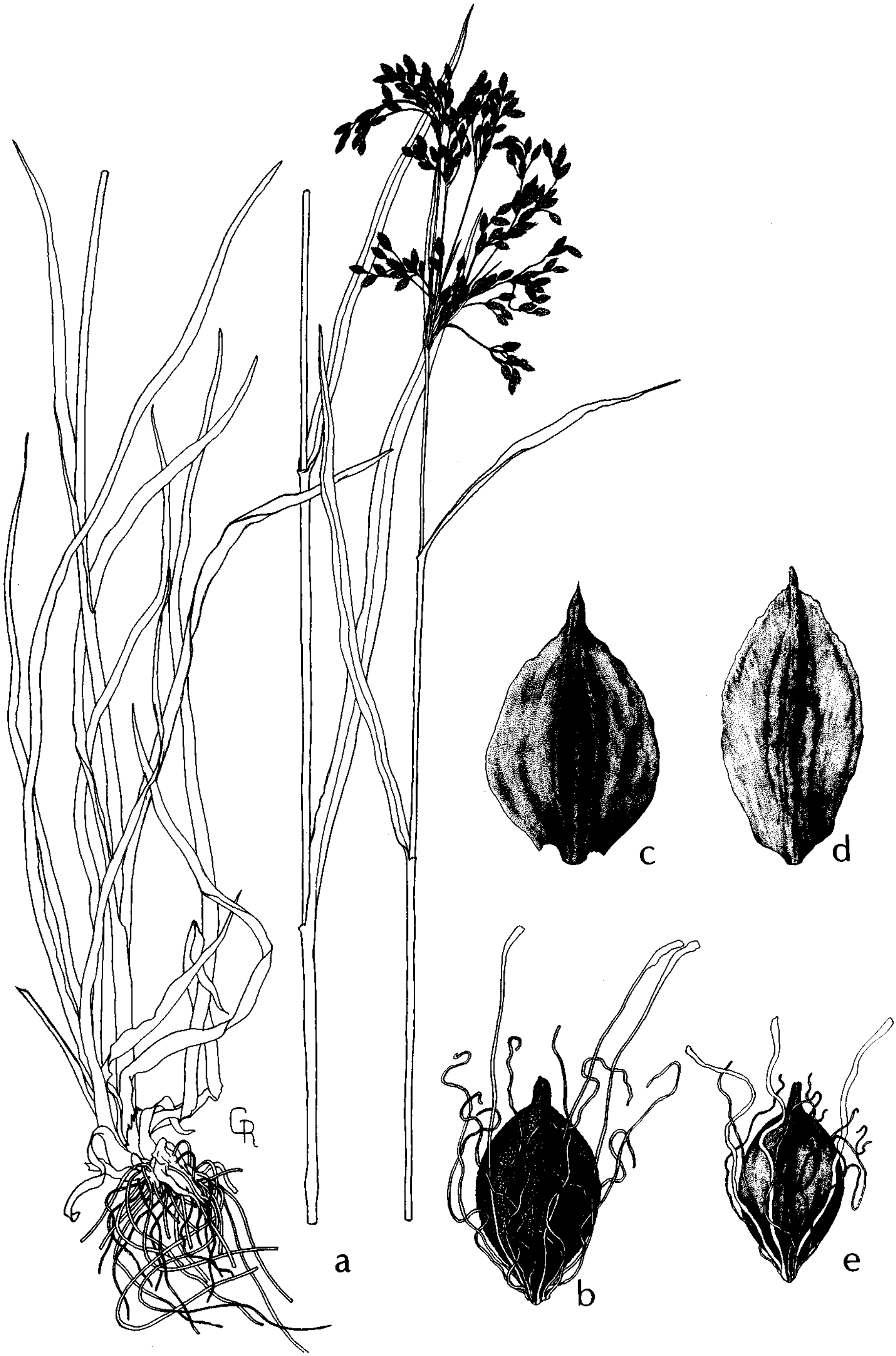

Fig. 209. a–c, **Scirpus pendulus:** a, habit; b, achene; c, scale; d–e, **Scirpus lineatus:** d, scale; e, achene.

1. **Fuirena scirpoidea** Michx. Fig. 210

Perennial with very conspicuous long, branching rhizomes from which vertical flowering stems arise at intervals. Thus a plant may at first exhibit long lines of stems from the substrate, by further branching and elongating eventually producing extensive stands. Stems to about 6 dm tall. Leaves bladeless, glabrous sheaths. Spikelets terminal and solitary or in clusters of 2–several, subtending bract shorter than the spikelets. Scales of the spikelet pubescent, oblong-oval, tipped by a mucro or short awn. Blade of perianth scale oval, ovate, or subreniform, apically short-apiculate, alternating bristles strongly downwardly barbed, from about as long as the stipe of the achene to about equalling the achene body. Achene dark brown at maturity, short-stipitate, body obovate in outline, 1 mm long or a little more, bearing a thickish, prominent, pubescent, persistent style base at the summit.

Wet sands, peaty sands, wet marls, lake and pond shores, boggy depressions, shores of estuaries, pineland depressions, cypress prairies, ditches. Coastal plain, Ga., Fla., to s.e. Tex.; Cuba.

In Florida and in the Gulf coastal plain to Mississippi (and one locality in s. Texas), in habitats similar to those inhabited by *F. scirpoidea* and frequently growing with *F. scirpoidea,* there occurs a plant very closely similar to that species. If distinguished from it as a separate species, the name is *F. longa* Chapm. It differs in having shorter, more branched rhizomes, thus the stems frequently appear tufted; the sheaths from mid-stem upward bear flat, short, linear blades 1.5–5.0 cm long. Spikelets are often (not always) in 2 clusters and the subtending bracts are nearly as long as to longer than the spikelets.

2. **Fuirena breviseta** (Coville) Coville in Harper. Fig. 211

Perennial with short rhizomes and clump-forming, the offshoots with subcormose bases. Stems mostly 2–5 dm tall, sometimes somewhat taller, pubescent below the inflorescence. Lower and median sheaths hirsute, the upper sparsely hirsute or hirsute only at or near the summit; lowermost sheaths bladeless, those above with linear-attenuate blades mostly 3–6 mm wide, variable in length to about 10–15 cm; membranous collar or ligule at summit of sheath glabrous. Spikelets 2–several in terminal clusters, commonly with 1–3 subterminal clusters on axillary stalks; spikelets ovate to oblong, mostly to 10–20 mm long full developed. Body of the scales of the spikelet 2 mm long, oblong to obovate, strongly 3-nerved, with spreading to arching-recurved, acicular, pubescent tips usually longer than the body. Blade of perianth scale suborbicular to oval or ovate, mostly bluntly pointed apically but the pointed tip commonly inrolled and thus superficially appearing apiculate, alternating bristles no longer than the stipe of the achene, often shorter, weakly and sparsely if at all barbed, the barbs pointing upward or outward. Achene olivaceous to brown at maturity, body obovate in outline, 0.5 mm long, the edges of the angles pale-banded, stipe nearly as long as the body, apiculate apically.

Sandy, peaty-sandy muck, peat or marly soils, marshy shores, cypress prairies, depressions in pine savannas and flatwoods, borders of swamps, bogs, wet clearings, ditches. Coastal plain, s.e. Va. to s. Fla., w. to e. Tex.

3. **Fuirena squarrosa** Michx. Fig. 211

In general habital appearance similar to *F. breviseta.* Membranous collar or ligule at summit of leaf sheath pubescent. Perianth scales with acuminate to awned apices, alternating bristles reaching to about ¾ the length of achene body, strongly downwardly barbed. (Incl. *F. hispida* Ell.; *F. hispida* sensu Small (1933))

Bogs and boggy shores. N.J. to Fla. and Tex., in the interior to Okla. and Ky.; Cuba, P.R.

4. **Fuirena pumila** (Torr.) Spreng. Fig. 212

Cespitose annual, in general habital appearance much like the preceding. Membranous collar or ligule at summit of leaf sheath glabrous or pubescent. Apex of perianth scale

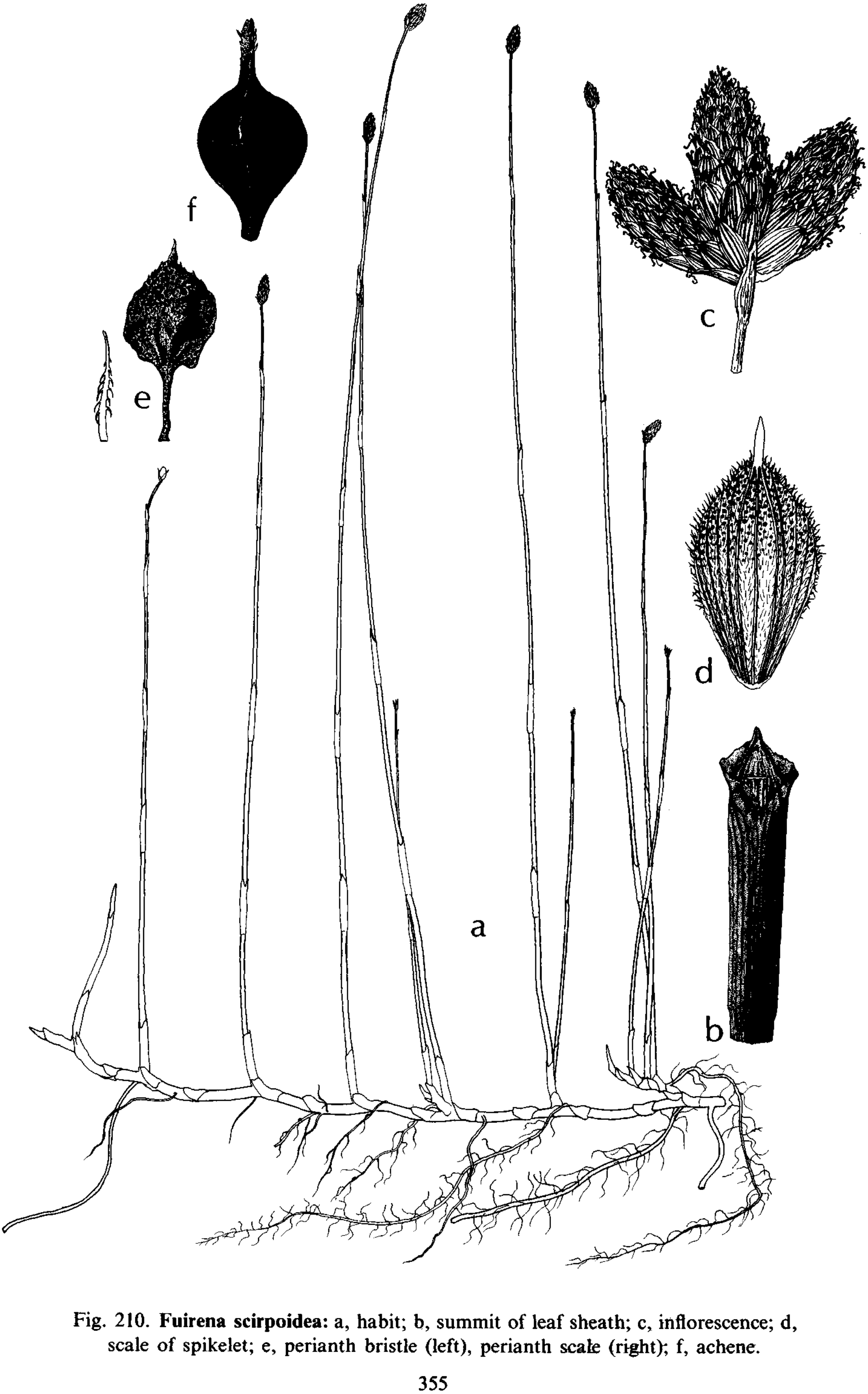

Fig. 210. **Fuirena scirpoidea:** a, habit; b, summit of leaf sheath; c, inflorescence; d, scale of spikelet; e, perianth bristle (left), perianth scale (right); f, achene.

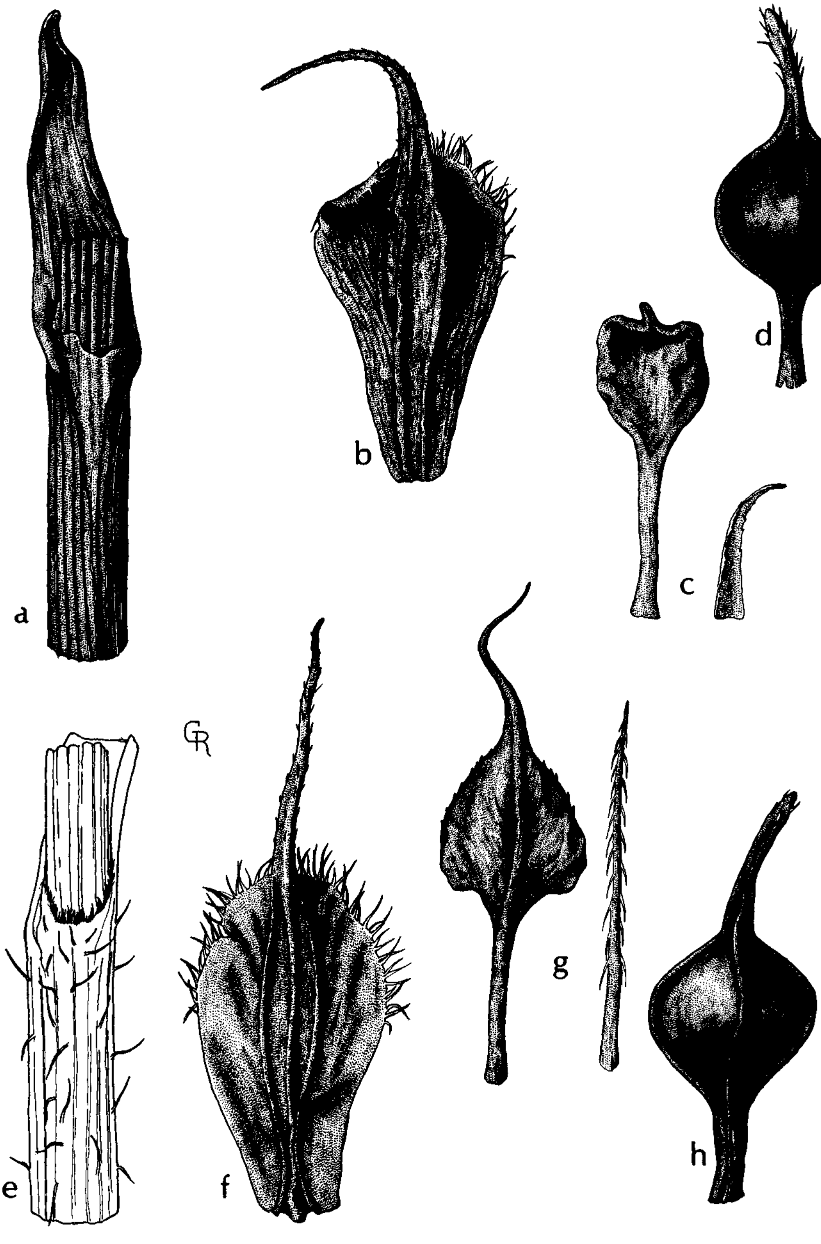

Fig. 211. a–d, **Fuirena breviseta:** a, summit of leaf sheath; b, scale of spikelet; c, perianth scale (left), perianth bristle (right); d, achene; e–h, **Fuirena squarrosa:** e, summit of leaf sheath; f, scale of spikelet; g, perianth scale (left), perianth bristle (right); h, achene.

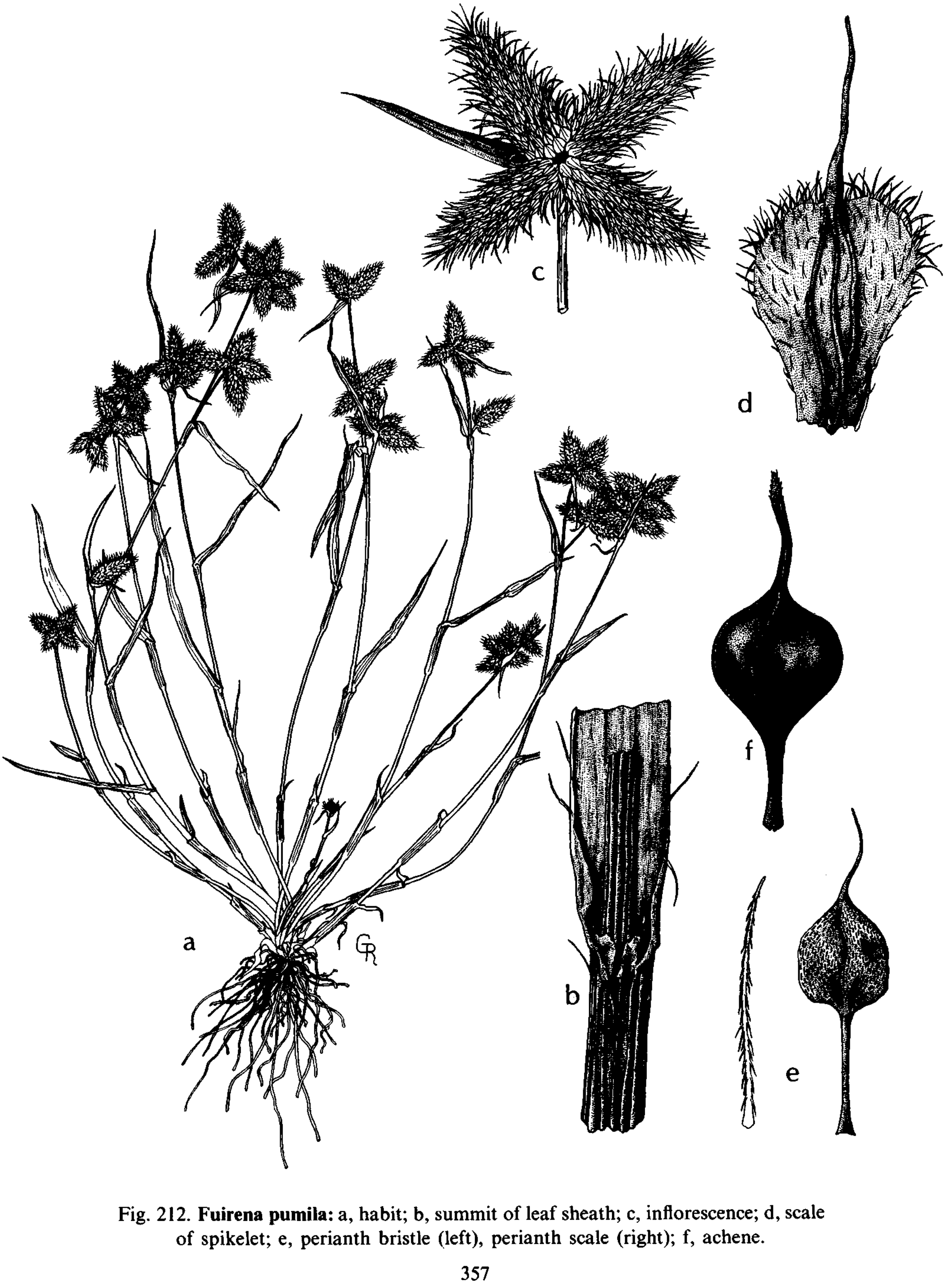

Fig. 212. **Fuirena pumila:** a, habit; b, summit of leaf sheath; c, inflorescence; d, scale of spikelet; e, perianth bristle (left), perianth scale (right); f, achene.

thin, incurved-acuminate and narrowed to a bristlelike tip; alternating perianth bristles as long as the body of the achene, usually longer, strongly downwardly barbed. (*F. squarrosa* sensu Small (1933))

Habitats as for *F. breviseta.* Coastal plain, Mass. to cen. pen. Fla., w. to La.; Great Lakes lowlands.

5. Fuirena simplex Vahl.

Perennial, usually 2–4 dm tall, sometimes to 1 m, with stout and short to long and slender rhizomes, not producing cormous offshoots. Lower stem hispid or hirsute. Leaf sheaths pubescent, membranous collar or ligule at the summit glabrous or pubescent. Apex of perianth scales blunt, truncate, or usually retuse, with a retrorsely barbed bristle that arises subapically; alternating perianth bristles as long as the body of the achene or exceeding it.

Open swamps, swales, bogs, ditches. s. Kans. and Ill., southward through the interior highlands and plains to Tex. and N.Mex.; Mex. to Nicar.; Cuba, P.R., Jam.

13. Dichromena (WHITE-TOP SEDGES)

Perennials. Lower internodes very short, increasing in length upwards, leaves thus appearing mostly basal, uppermost node from ⅓ to ½ height of stem. Inflorescence of crowded clusters of spikelets (in ours) subtended by 2–10 long-attenuate, leaflike bracts, conspicuously white at base and green at apex, spirally arranged with the longest as the outermost, gradually decreasing in size to very small subtending the individual spikelet in the head. Spikelets few- to several-flowered, often aborting. Perianth lacking. Stamens 3. Style bifid. Achene lenticular, surface marked with alveoli and often ridged by the upper edges of the cancellations, topped by the swollen, persistent base of the style.

1. Involucral bracts usually 7–10; tubercle shortly decurrent on the achene. 1. *D. latifolia*
1. Involucral bracts usually 3–6; tubercle truncately capping the achene.
    2. Plant cespitose or tufted; achene including the tubercle 1 mm long, its surface horizontally irregularly ridged. 2. *D. floridensis*
    2. Plant not tufted, stems solitary from slender rhizomes; achene including the tubercle 1.5 mm long, its surface horizontally cancellate. 3. *D. colorata*

1. Dichromena latifolia Baldw. ex Ell. GIANT WHITE-TOP SEDGE. Fig. 213

Stems solitary, to 1.2 m tall, obtusely triangular to terete, from the nodes of slender, scaly rhizomes. Leaves linear-attenuate, to 5 dm long, 5–6 mm wide at base, gradually tapering to the long slender tip. Bracts of the inflorescence 7–10, 8–10 mm wide at base, 10–12 cm long, usually recurved at maturity. Spikelets elliptic, 5–7 mm long, several-flowered. Scales white or white with a brown base produced by minute brown lines, obtuse, keeled the full length, 4.5–6 mm long. Achene pale straw-color, biconvex with a wirelike border, 1.2–1.5 mm wide and long including the tubercle; surface finely alveolate, without transverse ridges or these obscure; tubercle decurrent to the extent that its base is shaped like a broadly inverted **V**.

Wet sandy-peaty open places, flatwoods or savanna, depressions, ditches, borders of shrub bogs. Coastal plain, Va. to Fla. and s.e. Tex.

2. Dichromena floridensis Britt. Fig. 214

Cespitose perennial. Stem slender, nearly terete, 1–4 dm tall, taller than the longest leaf. Leaves mostly basal, filiform, to about 1 mm wide, broader at base and long-attenuate, 1–2 dm long. Bracts of the inflorescence 3–6, slenderly attenuate, the longest 5–7.5 cm long, about 2 mm wide at base. Spikelet heads 4–7 mm broad, spikelets 4–7 mm long, oblong. Scales light, brown-based, white or greenish white, keeled, obtuse to broadly acute at apex. Achenes obovate, about 1 mm long, strongly biconvex, black or dark brown, transversely ridged; tubercle compressed-deltoid, short, truncate on top of achene.

Seasonally wet depressions on limerock or marl of pinelands. S. Fla., Fla. Keys; Bah. Is.

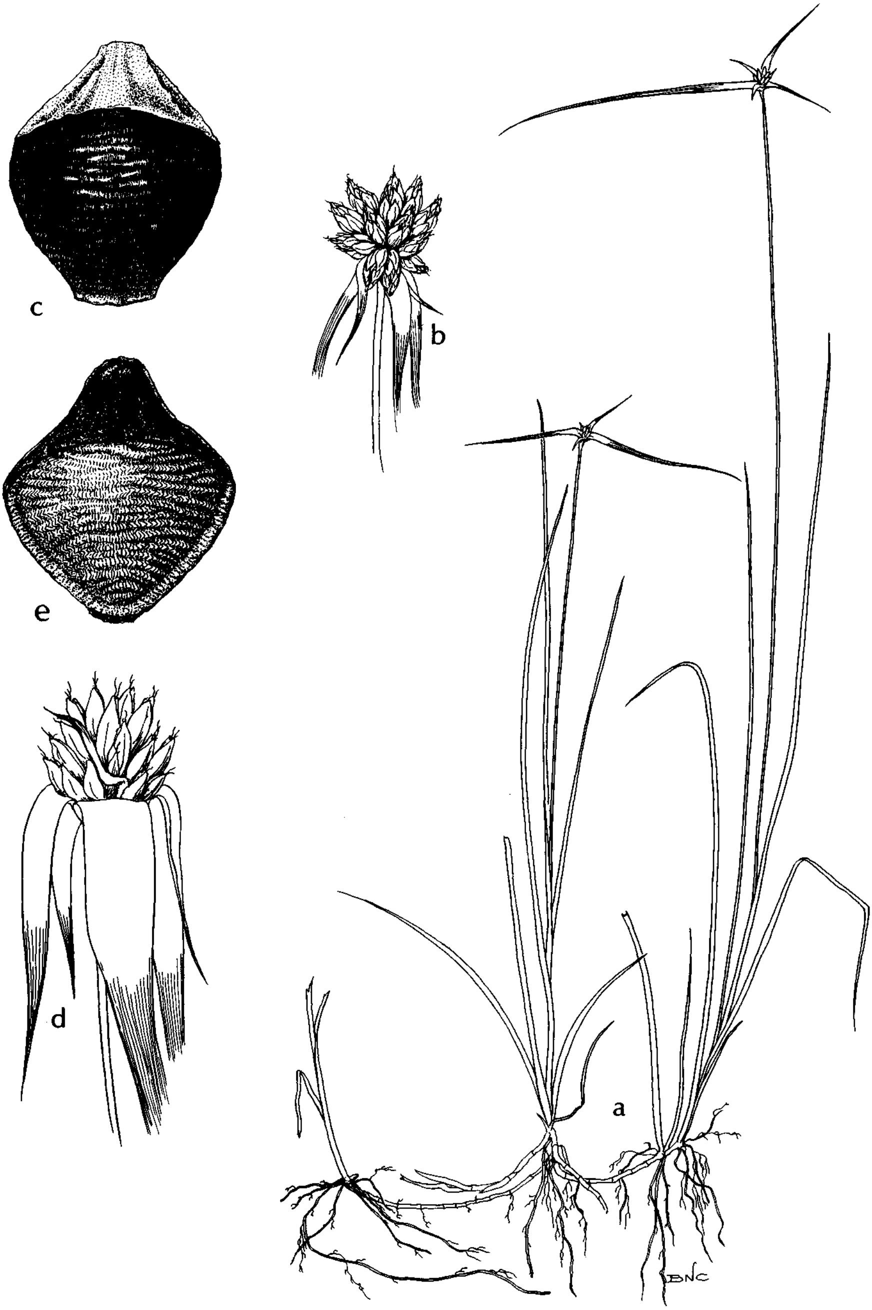

Fig. 213. a–c, **Dichromena colorata:** a, habit; b, inflorescence; c, achene; d–e, **Dichromena latifolia:** d, inflorescence; e, achene.

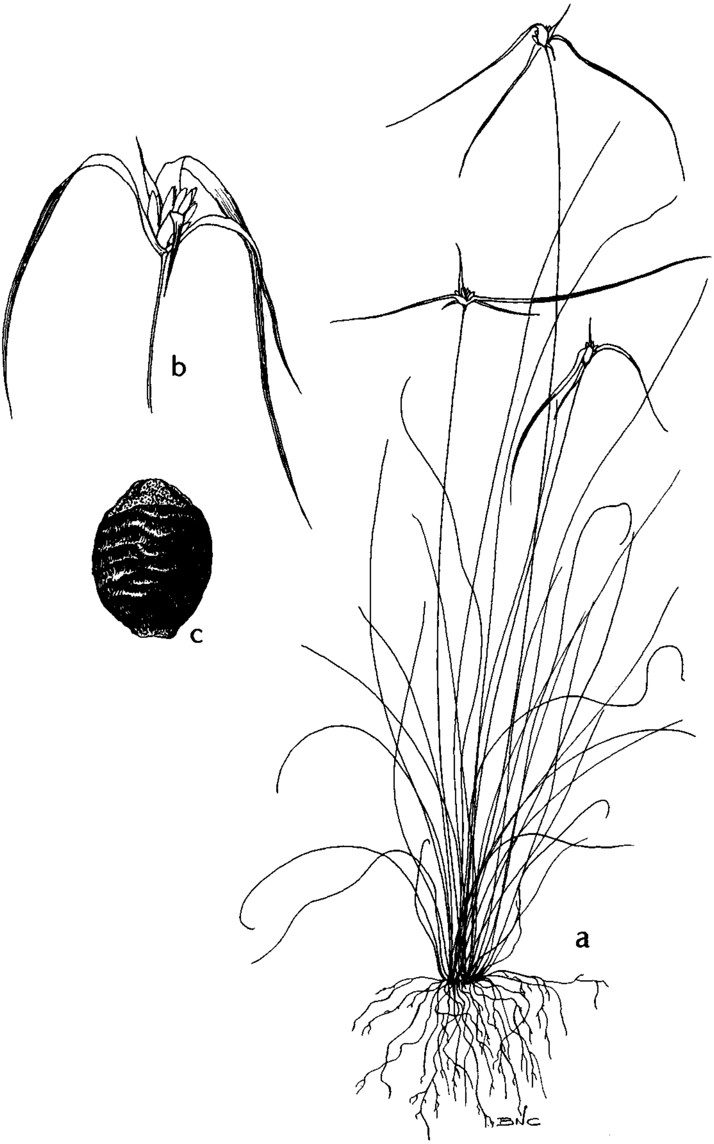

Fig. 214. **Dichromena floridensis:** a, habit; b, inflorescence; c, achene.

3. Dichromena colorata (L.) Hitchc. WHITE-TOP SEDGE. Fig. 213

Stems to 5–6 dm tall, triangular, solitary from slender straw-colored rhizomes, leafy at least the lower ½ of stem. Rhizome with dark brown, tubular leaf-sheaths at the nodes. Leaves shorter than stem, narrowly linear, long-attenuate, flat, 3–3.5 mm wide at base tapering gradually to a long tip, to 4 dm long. Bracts of the inflorescence 4–6, with long attenuate tips, outer bracts 3 mm wide at base, 10–12 cm long. Inflorescence of 10–20 white (or pale brown at maturity) spikelets, 8–12 mm in diameter. Spikelets 4–5 mm long, few to several-flowered. Scales oblong, obtuse at apex, keeled along the midrib near the apex. Achene light straw-colored, possibly turning dark brown or black at maturity, the surface transversely alveolate, 1–1.2 mm wide, 1.2–1.5 mm long; tubercle truncate on the apex of the achene, compressed deltoid, somewhat narrowed at the tip.

Wet sandy-peaty open areas, savannas, pine flatwoods, bogs, ditches, borders of flatwoods depressions. Coastal plain, Va. to Fla., thence westward to the Trans-Pecos, Tex.; e. Mex., B.Hond., W.I.

14. Psilocarya (BALD-RUSHES)

Annual herbs with leafy stems. Leaves few, blades narrow, triangularly channeled, elongate. Spikelets few to many in terminal and axillary umbelliform cymes, the cymes commonly broad and open. Flowers bisexual; perianth none; stamens 2, rarely 1. Ovary sessile, style one, stigmas 2, base of the style enlarged, becoming a tubercle. Achene lenticular.

1. Tubercle about as long as the achene, triangular-lanceolate, flat and soft, the style usually persistent. 1. *P. scirpoides*
1. Tubercle less than ⅓ the length of the achene, depressed across the summit of the achene, the style not persistent.
    2. Achene body with irregular transverse bone-colored and -textured ridges, 0.7–1.0 mm long. 2. *P. nitens*
    2. Achene body with horizontal lines of longitudinally elongate cancellations, mostly 1.5 mm long. 3. *P. schiedeana*

1. Psilocarya scirpoides Torr. Fig. 215

Stems to 7 dm tall. Spikelets lance-ovoid, 3–8 mm long. Scales lance-ovoid, acute, chestnut brown. Achene body 0.7–1.0 mm long, usually as broad, the surface smooth but with underlying sculpturing of low horizontal undulations and longitudinal cancellations. Tubercle thin, flat, triangular, about as long as the achene and not perceptibly differentiated from the rest of the style which is usually persistent. Filaments also usually persistent on the fruit.

Wet sands and sandy peats, marshy and mucky shores, flatwoods depressions. Coastal plain, Mass. to N.C. and the Fla. Panhandle; Great Lakes lowland.

2. Psilocarya nitens (Vahl) Wood. Fig. 215

Stems to 7 dm tall. Spikelet conic-ovoid, 4–8 mm long. Scales broadly ovate, obtuse, chestnut brown, closely imbricate. Achene body 0.7–1.0 mm long and usually as broad or broader, with bone-colored and -textured irregular and rounded transverse ridges. Tubercle much broader than high, rather like a thin cap atop the achene.

Wet sands, sandy peats and peats, clearings of and borders of wet woodlands, marshy shores, ditches and drainage canals. Coastal plain, Mass. to Fla., w. to Tex.; also n.w. Ind.

3. Psilocarya schiedeana (Nees) Liebm. Fig. 215

Stems to about 3 dm tall. Spikelet conic-ovoid, 6–15 mm long, frequently acuminate and somewhat falcate, scales broadly ovate, acute, reddish brown at first, becoming stramineous and transparent. Achenes mostly as broad as long, about 1.5 mm, with horizontal lines of longitudinally elongate cancellations, where the lines join sometimes

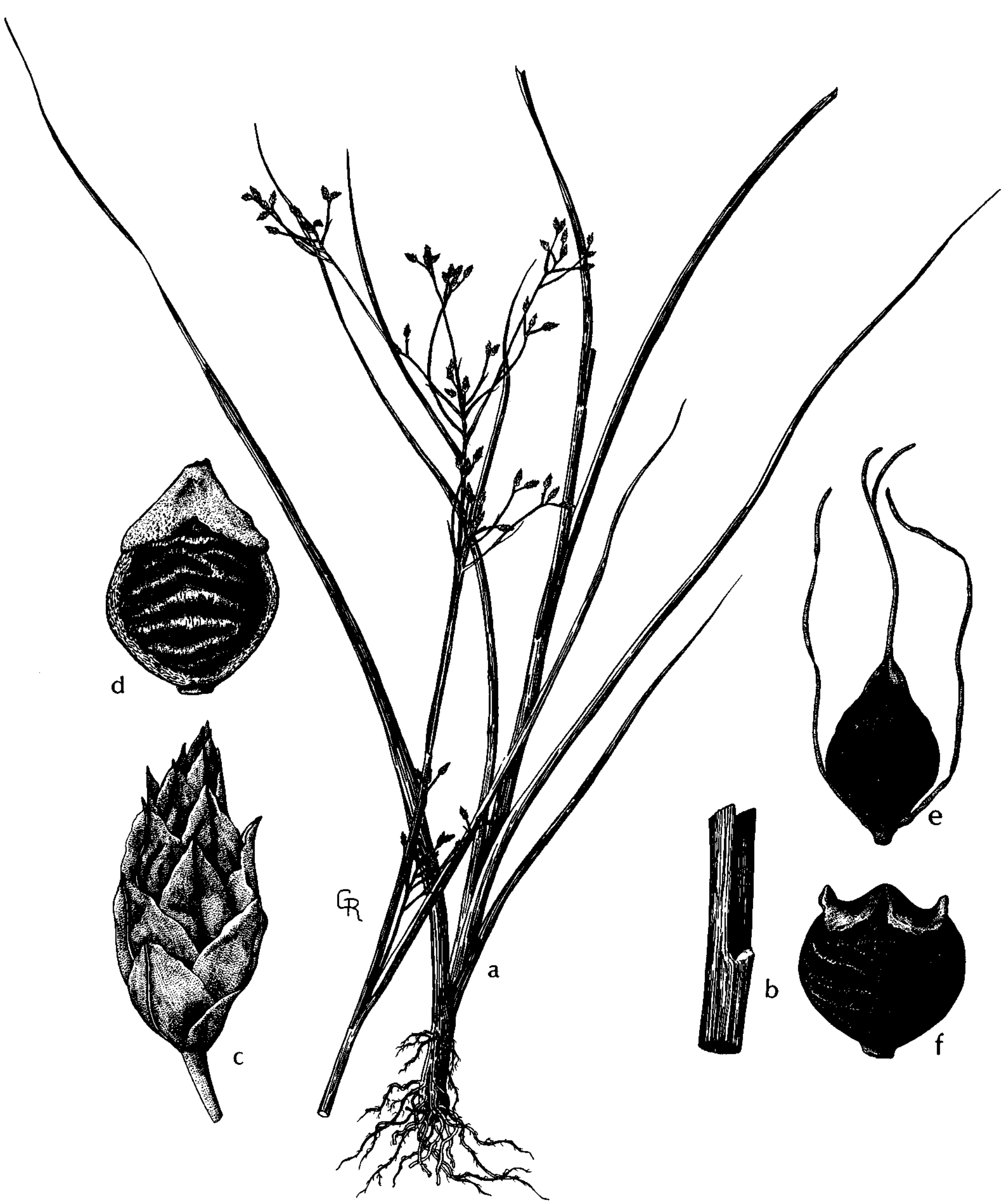

Fig. 215. a–d, **Psilocarya nitens:** a, habit; b, summit of leaf sheath; c, spikelet; d, achene; e, **Psilocarya scirpoides:** achene; f, **Psilocarya schiedeana:** achene.

forming undulating low ridges. Tubercle very broadly appressing the summit of the achene; as seen from the side very broadly conical in the middle, with an inverted V-shaped split below the cone, the lateral portions turned up, the whole tubercle in this view resembling the side view of a pair of saddles back to back.

Wet sands and sandy peats, borders of flatwoods ponds and depressions. Pen. Fla.; Mex., W.I.

15. Rhynchospora (HORNED-RUSHES, BEAK-RUSHES)

Perennial herbs (rarely annual), a few with elongate rhizomes and forming extensive colonies, mostly clump-forming. Stems leafy, glabrous, triangular or nearly round. Leaves mostly shorter than the stems, the sheaths glabrous, blades glabrous except on the margins. Spikelets variously clustered, the clusters terminal or both terminal and axillary. Scales spirally imbricate, the lower 1 or 2 commonly empty, those above subtending bisexual flowers but the uppermost sometimes with a staminate or rudimentary flower. Stamens usually 3. Perianth of bristles (few with none), commonly 6, but in some fewer or up to 20. Achenes flat or lenticular, surmounted by a tubercle representing a hardened base or even most of the style, the tubercle of different texture than that of the achene.

Although after considerable study and experience one may learn to recognize a considerable number of the species of *Rhynchospora* in the field, we find it an impossible task to communicate concepts so learned and in our key and descriptions rely principally upon characters of the reproductive structures most of which may be seen only with magnification, this often exceeding 10 ×. It is best, if not wholly necessary in most cases, to have ripe achenes. In some cases perianth bristles are easily detached in dissection so that care must be exercised in determining whether or not they are present. In addition, not uncommonly, filaments persist and are attached to the achene base and may be mistaken for perianth bristles. Markings and configurations on achenial surfaces are frequently very diagnostic for a species yet they are difficult to describe in terms suitable to convey conceptual differences or distinctions; degree of success in discerning patterns is enhanced by experience.

Two well-marked species not included in the treatment below are: *R. grayii* Kunth and *R. megalocarpa* Gray. Both appear to be wholly restricted to well-drained soils of sand ridges and sand hills of the coastal plain, never occur on poorly drained sites.

Several species recognized by other authors, notably Gale (1944) seem to us either not distinct or of very rare occurrence. They are alluded to in most cases by notes under a treated species.

1. Tubercles long-subulate, 4 mm long or longer, at maturity extending conspicuously, bristlelike, beyond the spikelet scales.
  2. Stems slender; leaf blades slender-elongate, about 8 mm wide, the sides folded upward and appressed; spikelets in 1–several compact globose clusters. 1. *R. tracyi*
  2. Stems coarse; leaf blades coarse, striate, 1.5–2.0 cm wide; spikelets in loose to tight clusters but never in compact globose clusters, commonly the clusters many in a widely diffuse inflorescence.
    3. Perianth bristles (the longer ones) shorter than to as long as the achene body. 2. *R. corniculata*
    3. Perianth bristles all longer than the achene body.
      4. Plants cespitose, perennating by short lateral offshoots; spikelets in tight sessile clusters or in tight clusters on stiffly erect branchlets. 3. *R. macrostachya*
      4. Plants perennating by slender scaly stolons; spikelets in loose clusters on flexuous branchlets. 4. *R. inundata*

1. Tubercles various but not exceeding 2 mm long and at maturity not extending conspicuously bristlelike beyond the spikelet scales.
  5. Perianth bristles definitely plumose, at least on the lower portions.
    6. Spikelets 7–8 mm long, borne singly or in remote loose clusters, some on slender stalks.
      7. Achene body broadly elliptic, its summit markedly constricted then flaring into a collarlike flange, a conic tubercle seated within the collar. 5. *R. oligantha*

7. Achene obovoid, the apex not constricted then flaring, a conic tubercle seated skullcaplike upon its summit. 6. *R. breviseta*

6. Spikelets 2–4 mm long, several to many in tight clusters. 7. *R. plumosa*

5. Perianth bristles barbellate, or smooth, or not present.

8. The perianth bristles 16–20. 8. *R. macra*

8. The perianth bristles 12 or less.

9. Bristles barbed downwardly.

10. Scales of the spikelet whitish or pale pinkish brown; bristles (8–) 10–12. 9. *R. alba*

10. Scales of the spikelet chestnut brown to dark brown; bristles 6.

11. Spikelets in compact globose or subglobose clusters, the lower spikelets usually reflexed.

12. Expanded portion of the achene (above the stipe) suborbicular to slightly obovate, the apex rounded; larger spikelet clusters seldom exceeding 1 cm across. 10. *R. microcephala*

12. Expanded portion of the achene (above the stipe) pronouncedly obovate, the apex nearly truncate; spikelet clusters mostly 1.5–2.0 cm across. 11. *R. cephalantha*

11. Spikelets in turbinate clusters, all the spikelets usually ascending.

13. Achene with a pale banded margin, obovate or obpyriform.

14. Spikelets 1-fruited. 12. *R. chalarocephala*

14. Spikelets 2 (–3)-fruited, or if 1-fruited then a sterile or rudimentary floret present as well.

15. Face of achene with a prominent pale bulge centrally, summit (below tubercle) nearly truncate. 13. *R. glomerata*

15. Face of the achene gradually rounded, without a central bulge, usually uniformly brown, summit rounded. 14. *R. capitellata*

13. Achene without a pale banded margin, long-elliptic. 15. *R. capillacea*

9. Bristles of the perianth upwardly barbed, smooth, or absent.

16. Surface of achene smooth, minutely pitted, or very finely striate (not reticulate).

17. Base of plant somewhat swollen and bulblike, clothed with firm ovate scales and producing scaly stolons. 16. *R. pallida*

17. Base of plant not swollen and bulblike.

18. Perianth bristles none. 17. *R. chapmanii*

18. Perianth bristles present though sometimes much shorter than the achene body and unequal.

19. Perianth bristles 12. 18. *R. baldwinii*

19. Perianth bristles 4–6.

20. Leaves with a short taper at the tip. 19. *R. ciliaris*

20. Leaves with a long taper at the tip.

21. Longer perianth bristles not exceeding half the length of the achene body.

22. Stems and leaves filiform-wiry, usually less than 1 mm wide, tending to be flexuous and reclining; some leaves equalling the flowering stems in length. 20. *R. debilis*

22. Stems and leaves coarser, stem 1.5–2.5 (–3.0) mm wide near the base, leaves not nearly as long as the flowering stems; stems stiffly erect. 21. *R. fascicularis*

21. Longer bristles equalling or exceeding the achene body (in *R. fernaldii* some are less than half as long).

23. Achene narrowly elliptic to narrowly obovate, about 2 times as long as broad. 22. *R. curtissii*

23. Achene oval to definitely obovate.

24. Plant delicately stoloniferous. 23. *R. pleiantha*

24. Plant cespitose.

25. Tubercle subulate, as long as the achene body, usually longer. 24. *R. gracilenta*

25. Tubercle not subulate, broadly deltoid and low, or if narrowed above and straplike, shorter than the achene body.

26. Achene body 1.0 mm long or less.

27. Perianth bristles mostly as long as the tubercle or exceeding it. 25. *R. filifolia*

27. Perianth bristles little exceeding the achene body, or some of them shorter. 26. *R. fernaldii*

26. Achene body 1.3–1.5 mm long.

28. Leaves filiform, less than 1 mm wide; some perianth bristles as long as the achene body, some usually somewhat shorter. 27. *R. wrightiana*

28. Leaves not filiform, mostly 2–4 mm wide; perianth bristles slightly surpassing the achene body. 21. *R. fascicularis*

16. Surface of the achene transversely ridged, rugose, or variously honeycombed-reticulate.

29. Perianth bristles none; achene 0.8 mm long or less, surmounted by a tiny skullcaplike tubercle.

30. Surface of achene with transverse ridged-reticulate pattern (seen with suitable magnification). 28. *R. pusilla*

30. Surface of achene proper smooth, not transversely ridged-reticulate, but with an underlying reticulate pattern (seen with suitable magnification). 29. *R. divergens*

29. Perianth bristles usually present, if poorly developed or absent then the tubercle deltoid.

31. Stems and leaves filiform-wiry and flexuous.

32. Spikelets mostly 3–4 mm long; perianth bristles shorter than the achene body. 30. *R. rariflora*

32. Spikelets mostly 4–5 mm long; perianth bristles nearly equal to or exceeding the tubercle. 31. *R. stenophylla*

31. Stems and leaves not filiform-wiry, stouter.

33. Faces of the achene flat or sunken.

34. Achene twice as long as broad or longer, elliptic-oblong; tubercle subulate. 32. *R. inexpansa*

34. Achene less than twice as long as broad, obovate; tubercle not subulate.

35. Tubercle with a circular, flat, platelike base, its periphery extending outward over the narrowed summit of the achene, conical above the base. 33. *R. compressa*

35. Tubercle deltoid.

36. Bristles less than half as long as the achene body or none.

37. The bristles 1–3 (-6), or none; transverse ridges on achene face 8 or less. 34. *R. perplexa*

37. The bristles 6; transverse ridges on achene face 10 or more. 35. *R. torreyana*

36. Bristles surpassing the tubercle. 36. *R. elliottii*

33. Faces of the achene convex or tumid, sometimes with a central bulge.

38. Achene at maturity rich mahogany brown to black; tubercle usually with a distinctly textured cartilaginous or crustaceous rim at its base (see also note under species no. 37). 37. *R. harveyi*

38. Achene chestnut brown; tubercle without a distinctly textured rim at its base.

39. Perianth bristles shorter than the achene body.

40. Tubercle conical; face of the achene with a definite bulge or hump toward the apex; achene body 1.6–2.0 mm long. 38. *R. globularis*

40. Tubercle deltoid; face of the achene biconvex but not with a bulge or hump; achene body 1.0–1.2 mm long. 39. *R. microcarpa*

39. Perianth bristles equalling the achene or longer.

41. Branches of the inflorescence spreading nearly at right angles to the main axis, the inflorescence very open, each spikelet or small cluster on slender spreading or reflexed stalks. 40. *R. miliacea*

41. Branches of the inflorescence ascending.

42. Spikelets 6–9 mm long. 41. *R. odorata*

42. Spikelets not exceeding 4.5 mm long.

43. Bristles not exceeding the achene body. 42. *R. decurrens*

43. Bristles exceeding the tubercle.

44. Tubercle setose on the margin.

45. Achene body subrotund or broadly obovate in outline; surface with horizontal ridges formed by the transverse walls of longitudinally oriented oblong alveoli. 43. *R. caduca*

45. Achene body ellipsoid-obovate; surface with near isodiametric or short-oblong alveoli, not transversely ridged. 44. *R. mixta*

44. Tubercle smooth on the margins. 39. *R. microcarpa*

1. Rhynchospora tracyi Britt. Fig. 216

Slender perennial with slender scaly stolons, commonly forming extensive colonies, especially when growing in shallow water. Stem to about 1.2 m tall, striate, nearly terete. Leaves slender, about 8 mm wide, striate and strongly involute, elongate, the longer equalling the stems. Spikelets in 1–2 (–several) globose clusters 1–2 cm across. Spikelets lanceolate, the scales light chestnut brown. Achene flattish, obovate, body 2.5–3.0 mm long, surficially very finely papillate, brown; bristles 6, exceeding the achene, upwardly finely toothed; tubercle long-subulate and exserted from the spikelet scales 4–5 mm.

Commonly in water, ponds, marshes, wet pinelands, cypress-gum depressions, and ditches. Coastal plain, S.C. to Fla. and Miss.; W.I.

2. Rhynchospora corniculata (Lam.) Gray. Fig. 217

Very coarse perennial, either cespitose and with short lateral offshoots or perennating by long, coarse, large-scaly stolons and thus forming rather extensive colonies. Plants 1–1.5 m tall, the stems sharply triangular, leafy. Leaves coarse, the blades variable in width, to 2 cm wide, flat to keeled. Inflorescences very variable in overall size, commonly to 5 dm high (or higher) from the first branch and to 3 dm across, diffuse-paniculate, the spikelets in loose clusters of, commonly, 5–14 terminating ultimate branchlets. Spikelets lanceolate, chestnut-brown, to about 2.5 cm long, the distal third to half consisting of the exserted portion of the tubercle. Achene obovate, flattish, body 3.5–5 mm long and 2–3.5 mm broad; bristles (3–) 4–6, unequal, none surpassing the achene body; tubercle long-subulate, 10–20 mm long. (*R. careyana* Fern.)

Marshy shores of ponds, lakes, streams, flatwoods depressions, in swamps, ditches, canals, sloughs. Del. to Fla., w. to e. and s.e. Tex., n. in the interior, Okla., Ky., Ind., and Mo.; W.I.

Other than by means of presence or absence of rhizomes, we find no characters by which definitively to distinguish *R. corniculata* and *R. careyana.*

3. Rhynchospora macrostachya Torr.

Cespitose perennial, similar to the preceding but on the average neither as tall nor as coarse. Inflorescence with many fewer branches (even with clusters of spikelets sessile on a single axis), the branches stiffly erect rather than diffusely spreading. Inflorescence clusters dense, commonly with 10–30 spikelets. Achene obovate, flattish, 4–5.5 mm long and 2.5–3 mm wide; bristles 5–6, surpassing the achene, mostly 10–12 mm long; tubercle long-subulate, much exserted from the spikelet, 15–20 mm long.

Marshy shores of ponds, lakes, streams, borders of swamps, swales and ditches. E. Mass. to Ga., w. to e. and s.e. Tex., n. in the interior to w. Kans., Mo., and s. Mich.

4. Rhynchospora inundata (Oakes) Fern. Fig. 217

Perennial with scaly long stolons, commonly forming extensive colonies. Very similar habitally to *R. corniculata* though much less coarse and not so tall, to about 1 m. Leaves 1 cm wide or less. Inflorescence very much resembling that of *R. corniculata* in being diffuse and having the spikelets in loose clusters; in overall size much smaller, usually not exceeding 30 cm high and 15–20 cm broad. Achenes obovate, flattish, body 4–5 (–6) mm long and (2–) 2.5–3.5 mm wide; bristles 5–6, surpassing the achene, 8–9 (–10) mm long; tubercle long-subulate, much exserted from the spikelet, 12–15 (–18) mm long.

Mostly on peaty or mucky soils, swamps, cypress and cypress-gum ponds, depressions in savannas and flatwoods, bogs, ditches and canals, often very abundant on exsiccated peats of dried-up ponds. E. Mass. to s. and w. Fla. (w. to La.?).

5. Rhynchospora oligantha Gray. Fig. 218

Cespitose perennial. Stems and leaves capillary; tips of the fine leaves blunt and with entire margin as seen with suitable magnification. Spikelets usually 1–2 on each of 2 short branches at the apex of the stem, one branch erect, the other extending at right angles to the axis. Spikelets lanceolate to ovate-lanceolate, 7–8 mm long, chestnut

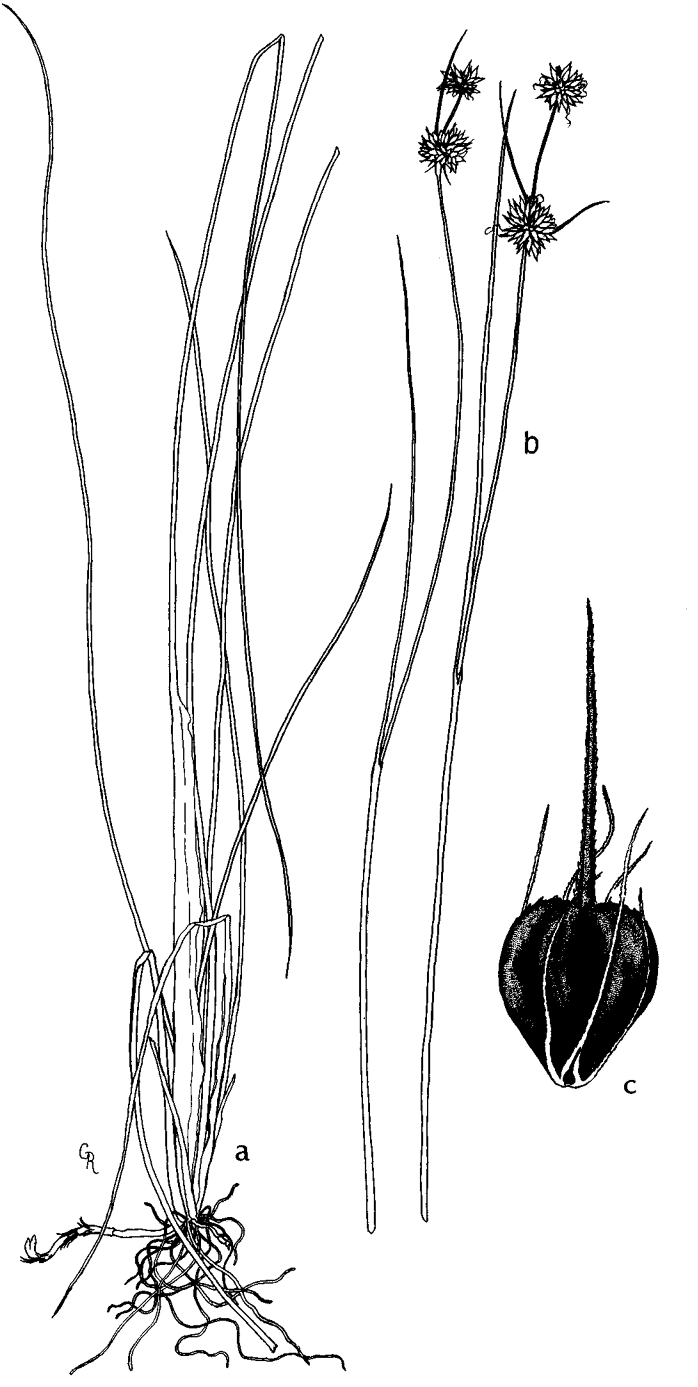

Fig. 216. **Rhynchospora tracyi:** a, base of plant; b, top of plant; c, achene.

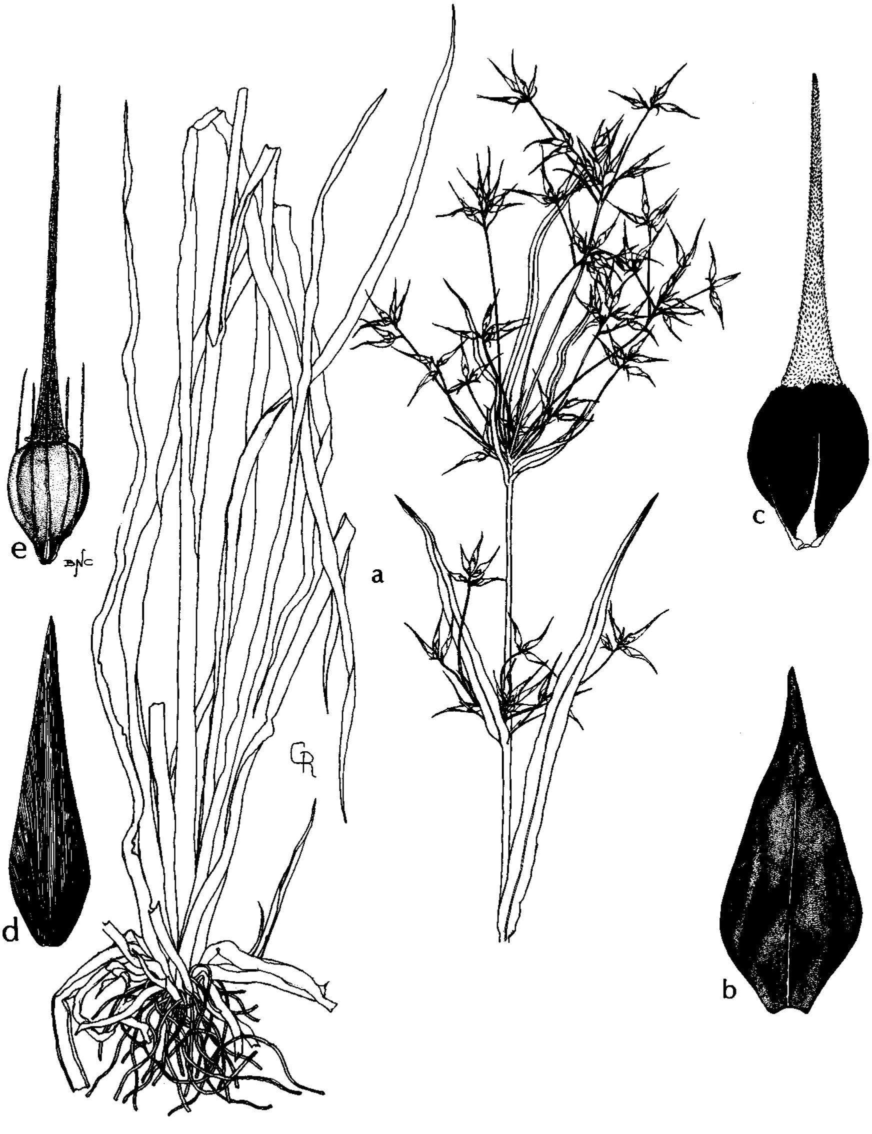

Fig. 217. a–c, **Rhynchospora corniculata:** a, habit; b, scale; c, achene; d–e, **Rhynchospora inundata:** d, scale; e, achene.

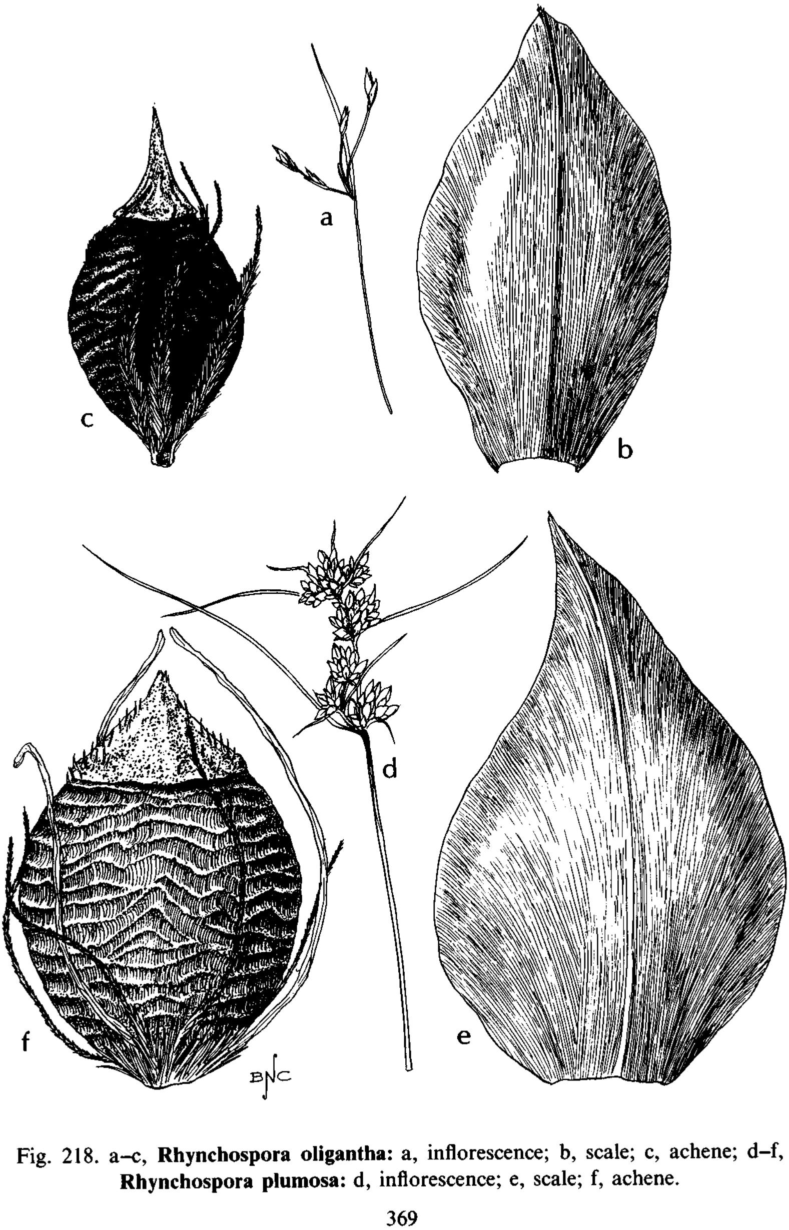

Fig. 218. a–c, **Rhynchospora oligantha:** a, inflorescence; b, scale; c, achene; d–f, **Rhynchospora plumosa:** d, inflorescence; e, scale; f, achene.

brown. Achene broadly ellipsoid, body 2.3–2.6 mm long, very turgidly biconvex, narrowed above then flaring into a collarlike flange, the tubercle seated within the collar; achenial surface very faintly ridged horizontally and with fine longitudinal striae, pale chestnut brown but finally ripening to dark brown; bristles 6, plumose below, upwardly barbed above, nearly equalling the achene to exceeding the tubercle; tubercle conic-subulate.

Rare, open bogs and seepage slopes, wet pine savannas and flatwoods. Coastal plain, s. N.J. to Fla. Panhandle thence to e. Tex.

6. **Rhynchospora breviseta** (Gale) Channell. Fig. 219

Closely similar to the preceding in respect to habit and inflorescences. Leaf tips minutely serrulate on the margins and pointed as seen with suitable magnification. Achene obovoid, 2 mm long, very turgidly biconvex, horizontally irregularly ridged, the surface finely reticulate with longitudinally elongate cells; bristles 6, widely plumose except for very short tips, less than half as long as the achene; tubercle conic with a depressed base, seated upon the rounded apex of the achene.

Bogs, pine savannas and flatwoods. Coastal plain, s.e. N.C. to cen. Fla., w. to s. Miss.; W.I.

7. **Rhynchospora plumosa** Ell. Fig. 218

Cespitose perennial. Stems, leaves, and inflorescences variable. Stems and leaves from very finely wiry and flexuous to coarsely wiry and stiff; the stems from 1–7 dm tall, the leaves from much shorter than to equalling the stems. Spikelets ovoid to lanceolate, 2–4 mm long, usually several to numerous in tight clusters (sometimes only 2–3 per cluster), the clusters from 1 or 2 to 8–10 closely set along the axis, i.e., spiciformly arranged. Achenes mostly 1.8–2.0 mm long, obovoid to broadly elliptic, turgidly biconvex, the surface reticulate, more or less wavy-ridged horizontally, the alveolae longitudinally elongate; bristles 6, from somewhat shorter than the achene to slightly surpassing the tubercle, widely plumose below grading upwardly to toothed above, sometimes plumose only at base, varying to plumose $^2/_3$ of the length; tubercle conic. (*R. intermedia* (Chapm.) Britt.; *R. semiplumosa* Gray)

Bogs, wet pine savannas and flatwoods, clearings of evergreen shrub bogs, usually where the soils are sandy-peaty. Coastal plain, N.C. to Fla., w. to s.e. Tex.; Cuba, C.Am.

It is with misgivings that we draw the description above broadly to include what we and others have identified as both *R. plumosa* and *R. intermedia.* In the field we have often seen the extremes of size in close proximity, i.e., neighboring clumps. In examining a fairly large series of collections, however, we are unable to ferret out sets of characters serving to delineate two taxa.

8. **Rhynchospora macra** (Clarke) Small. Fig. 220

Cespitose perennial. Stems acutely triangular, 3–7 dm tall. Leaves flat, 1.5–3.5 mm wide. Inflorescence of one terminal turbinate cluster of spikelets, 1–2.5 cm across at the top, and 1–2 smaller lateral ones, the latter sometimes not present. Spikelets lanceolate to ovate, 4–5 mm long, 1-flowered, light rusty brown. Achene obovate, lenticular, much narrowed at the base, about 2 mm long, the surface obscurely pitted, the central portion of each face pale, darkening to brown outwardly; bristles 16–20, retrorsely barbed at least on the distal half, rarely smooth throughout, longer than the achene; tubercle subulate, about 1 mm long.

Bogs and wet pine savannas and flatwoods. Ga., Fla. Panhandle, to e. Tex.

9. **Rhynchospora alba** (L.) Vahl. Fig. 220

Cespitose perennial. Stems slender, 3-angled, 1–6 dm tall. Leaves slender, 0.5–2 mm wide, keeled. Spikelets in turbinate clusters, the terminal to about 2 cm across at the top, usually with 1–several lateral clusters on slender stalks. Spikelets lanceolate to ovate-lanceolate, mostly 4–5 mm long, usually 2-fruited, the scales whitish to pale rusty

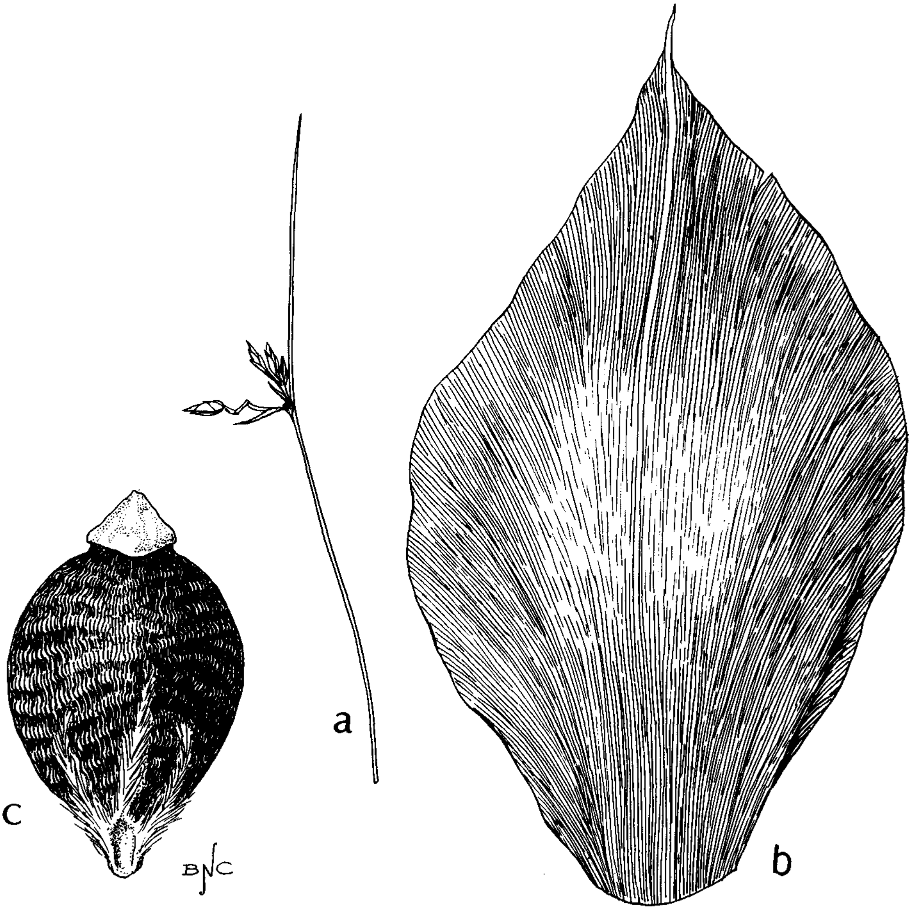

Fig. 219. **Rhynchospora breviseta:** a, inflorescence; b, scale; c, achene.

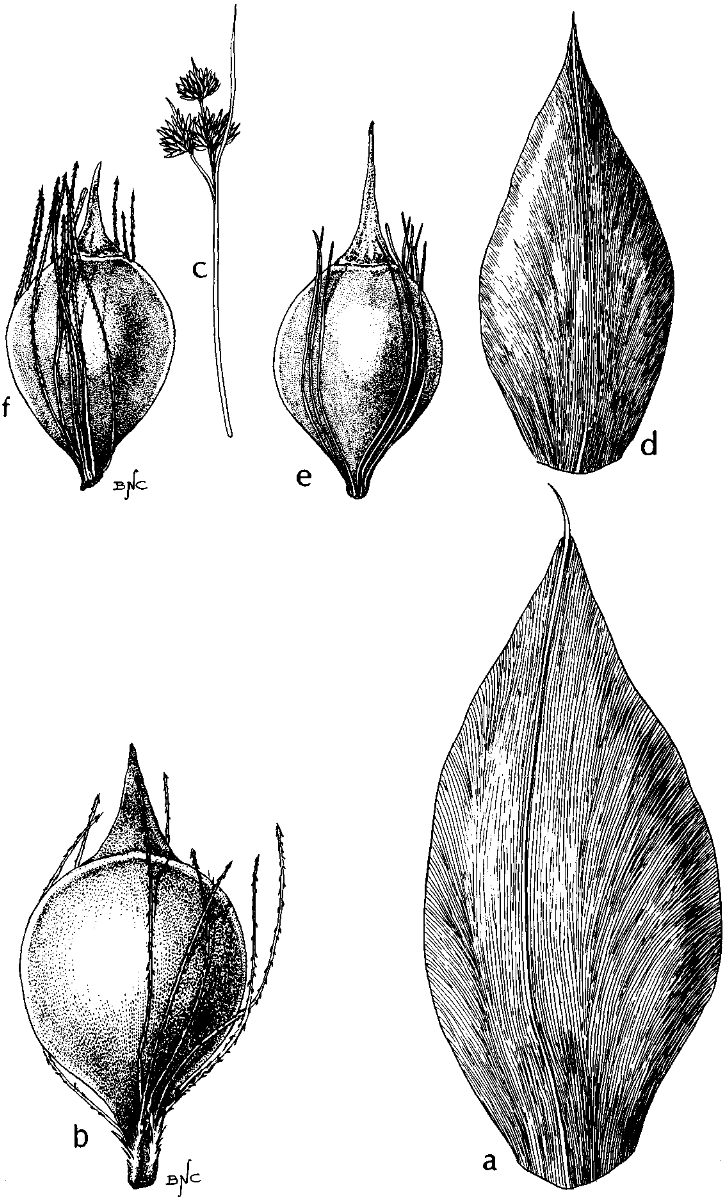

Fig. 220. a–b, **Rhynchospora alba:** a, scale; b, achene; c–f, **Rhynchospora macra:** c, inflorescence; d, scale; e–f, achenes.

brown. Achene obovate, biconvex, 1.5–1.8 mm long, pale in the center of the face, darkening toward the margin, the margin marked by a narrow longitudinal band; bristles (8–) 10–12, downwardly barbed, surpassing the achene, sometimes even the subulate tubercle.

Open sphagnous bogs. Nfld. to Md., s. in the mountains to N.C.; in the interior in the Great Lakes Basin; n. Idaho; Alaska to n. Calif.

10. Rhynchospora microcephala Britt. ex Small. Fig. 221

Cespitose perennial. Stems and leaves relatively slender but with considerable variation in robustness; stems mostly not exceeding 6.5 dm tall, leaves 1–3 mm wide. Spikelets in 1–5 or 6 widely separated globose or nearly globose clusters, the larger usually little if any exceeding 1 cm across; lower spikelets usually reflexed; dark chestnut brown, lanceolate, 1-fruited. Achenes with a suborbicular to slightly obovate expanded lenticular portion, abruptly narrowed below to a stipe, about 1.5 mm long including the stipe (excluding the tubercle), the body humped in the center of the face, this pale, rusty brown on the margin which is raised as a narrow band; bristles 6, prominently downwardly barbed, somewhat surpassing the subulate tubercle.

Wet sandy-peaty soils, depressions in pine savannas and flatwoods, borders of shrub bogs and swamps, marshy shores of pools or ponds, cypress-gum ponds; commonly colonizing clearings and ditches. Coastal plain, N.J. to cen. pen. Fla., w. to Miss.; Cuba.

In our experience this does not always appear to be clearly separable from *R. cephalantha.*

11. Rhynchospora cephalantha Gray. Fig. 222

Similar to the preceding in general features but rather more coarse and stout; stems commonly 1 m tall or slightly more, leaves 1–4.5 mm wide. Larger spikelet clusters mostly 1.5–2.0 cm across, the terminal one often lobed; lower spikelets usually reflexed in the cluster; clusters from 1–4 to 6–7 in number on a given stem and widely separate on the axis except for the most terminal ones. Spikelets lanceolate or ovoid-lanceolate, 4–6 mm long, dark brown 1-fruited. Achenes with a pronouncedly obovate expanded lenticular portion, approximately truncate at the summit, abruptly narrowed below to a stipe, 2.0–2.4 mm long including stipe (excluding the tubercle), the faces humped centrally and pale, rusty-brown to the margin which is raised and bandlike; bristles 6, downwardly setose or barbed, rarely upwardly barbed, equalling the subulate tubercle or nearly so. (*R. axillaris* (Lam.) Britt.)

Mostly in sandy-peaty or peat soils, marshy shores of ponds, lakes, streams, borders of swamps and shrub bogs, wet pine savannas and flatwoods, cypress-gum ponds; commonly colonizing clearings and ditches. Chiefly coastal plain, N.J. to s. Fla., w. to La.

12. Rhynchospora chalarocephala Fern. & Gale. Fig. 221

Plants vegetatively like the preceding. Spikelet clusters turbinate, the spikelets all ascending, the larger clusters about 1.8 cm across; clusters widely separated, often though not always several at a node and with unequal stalks. Spikelets lanceolate, 1-fruited, chestnut brown. Achenes with an obovate expanded lenticular portion, the apex more nearly rounded than truncate, abruptly narrowed to a stipe, 2 mm long including the stipe (excluding the tubercle), faces humped centrally and sometimes pale, darkening marginally to chestnut brown, or dark brown throughout, the margin banded; bristles 6, downwardly toothed, surpassing the subulate tubercle.

Pine savannas and flatwoods, bogs, marshy shores, ditches; commonly colonizing moist to wet clearings and ditches. Coastal plain, s. N.J. to cen. Fla., w. to La.

13. Rhynchospora glomerata (L.) Vahl. Fig. 222

Plants vegetatively similar to the preceding two, the spikelet clusters much like those of *R. chalarocephala* though usually more branched and darker brown. Spikelets

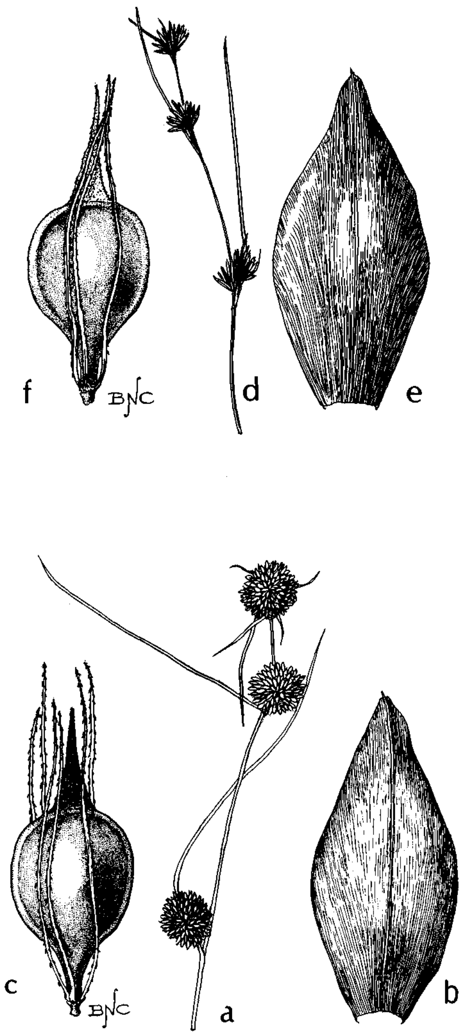

Fig. 221. a–c, **Rhynchospora microcephala:** a, portion of inflorescence; b, scale; c, achene; d–f, **Rhynchospora chalarocephala:** d, portion of inflorescence; e, scale; f, achene.

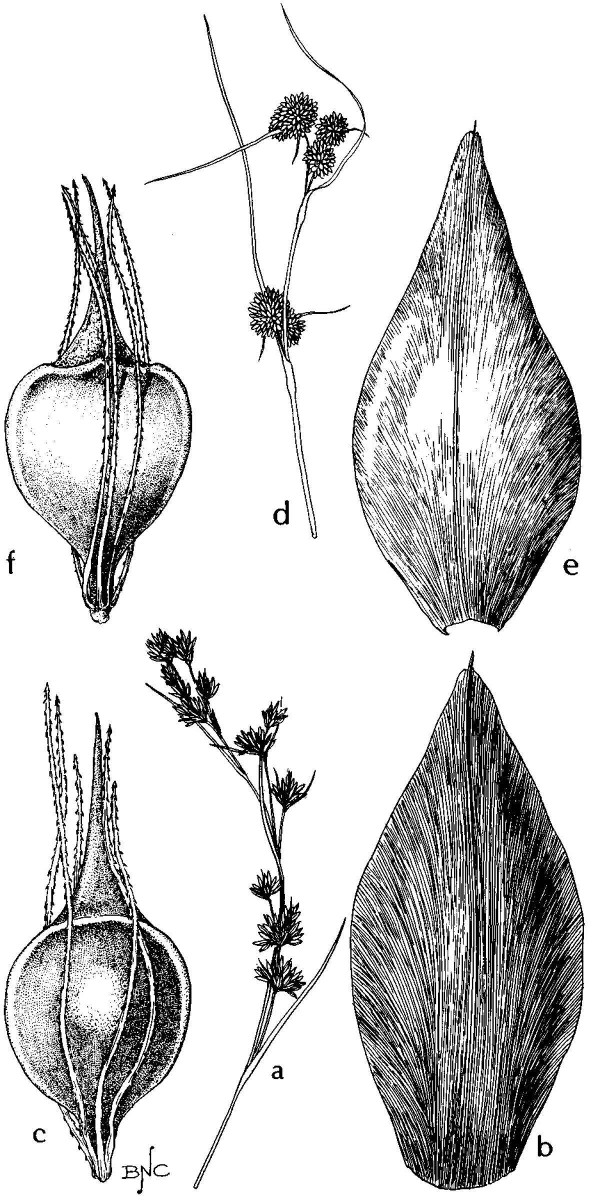

Fig. 222. a–c, **Rhynchospora glomerata:** a, portion of inflorescence; b, scale; c, achene; d–f, **Rhynchospora cephalantha:** d, portion of inflorescence; e, scale; f, achene.

lanceolate-attenuate, nearly fusiform, 6 mm long, 2(–3)-fruited, or if only 1-fruited then a sterile or rudimentary floret present as well. Achene with an obovate expanded lenticular portion, abruptly narrowed below to a stipe, 1.5–2.0 mm long including the stipe (excluding the tubercle), apically truncate, truncation relatively narrow, faces with a prominent pale bulge centrally, margin prominently bandlike; bristles 6, downwardly sharply barbed, slightly surpassing the subulate tubercle in length.

Seepage bogs, wet pine savannas and flatwoods, marshy shores, boggy pastures and meadows; commonly abundantly colonizing clearings and ditches. N.J. to n. Fla., w. to e. and s.e. Tex.; Ky., Tenn., Ark., Kans.

14. Rhynchospora capitellata (Michx.) Vahl. Fig. 223

Habitally similar to *R. glomerata* but much less coarse, usually not as tall. Leaf blades 0.5–3.5 mm wide. Body of the achene obovate, the summit rounded, faces rounded gradually, not humped or bulged centrally, usually evenly brown; perianth bristles downwardly barbed, the barbules diminishing downward. (*R. leptocarpa* Chapm.)

Bogs, wet pine savannas and flatwoods, marshy shores, stream banks, ditches. N. N.B., n. Maine, s.w. Que., s. Ont. to Wis., generally southward to n. Fla. and e. Tex.

15. Rhynchospora capillacea Torr. Fig. 223

Densely cespitose. Stems 1–4 dm tall, filiform. Leaves involute, filiform, 0.2–0.4 mm wide. Spikelet clusters 1 or 2, the terminal loosely spreading or narrow, with 2–10 spikelets, the lateral remote, subsessile, with 1–4 spikelets. Achene body about 2 mm long, long-elliptic, tubercle subulate, about as long as the achene body; perianth bristles as long as or surpassing the tubercle, retrorsely barbed.

Usually in calcareous places, bogs, shores, ledges. Nfld. to Sask., s. to w. Va., Tenn., Mo., S.Dak.

16. Rhynchospora pallida M. A. Curtis. Fig. 224

Perennial, the bases swollen, bulblike and covered with conspicuous ovate scales, stoloniferous. Stems mostly (4–) 6–8 cm tall, 3-angled, flexuous. Leaves narrowly linear, 1–3 mm wide, erect. Inflorescence a single terminal turbinate to broadly rounded cluster. Spikelets lance-ovoid, 4–6 mm long, 1-fruited, the scales silvery to pale rusty-reddish, mucronate. Achene suborbicular to obovate, about 2 mm long, lenticular, the face centrally with a pale hump, marginally chestnut brown, surface very minutely pitted; bristles none or 1–3 short ones; tubercle low, broadly deltoid.

Boggy sites, openings in white cedar swamps and evergreen shrub bogs, depressions in pine savannas. Coastal plain, L.I. to N.C.

17. Rhynchospora chapmanii M. A. Curtis. Fig. 224

Cespitose perennial. Stems finely wiry, obscurely 3-angled, striate, 3–6 dm tall. Leaves capillary, to 1 mm wide. Inflorescence solitary, terminal, turbinate to broadly rounded. Spikelets ovoid, 2–3 mm long, pale chestnut brown, the scales with aristate tips, 1-fruited. Achenes suborbicular to broadly elliptic, lenticular, about 1.2 mm long; surface coloring just before maturation pale, almost buff, broadly across the center, chestnut brown across base and apex; when fully ripe the face usually with a circular cartilage-colored central "eye" and chestnut brown all around marginally; margins raised and narrowly banded; bristles none; tubercle low, broadly deltoid.

Bogs, seepage slopes, wet sandy-peaty depressions, exposed shores of sandhill ponds, wet pine savannas and flatwoods; commonly colonizing sandy alluvial outwashes. Coastal plain, N.C. to cen. pen. Fla., w. to e. La.

Note: *R. solitaria* Harper is apparently superficially similar to *R. pallida* or *R. chapmanii.* It is, insofar as we know, known only from the type locality, namely Tifton, Barrien Co., Ga. Although it resembles *R. pallida* or *R. chapmanii,* it (as described) lacks the bulblike bases of the former, and unlike both which have no bristles, it has 3–5 fragile bristles some of which equal the tubercle, others about half the length of the achene body, all oriented to one side of the achene.

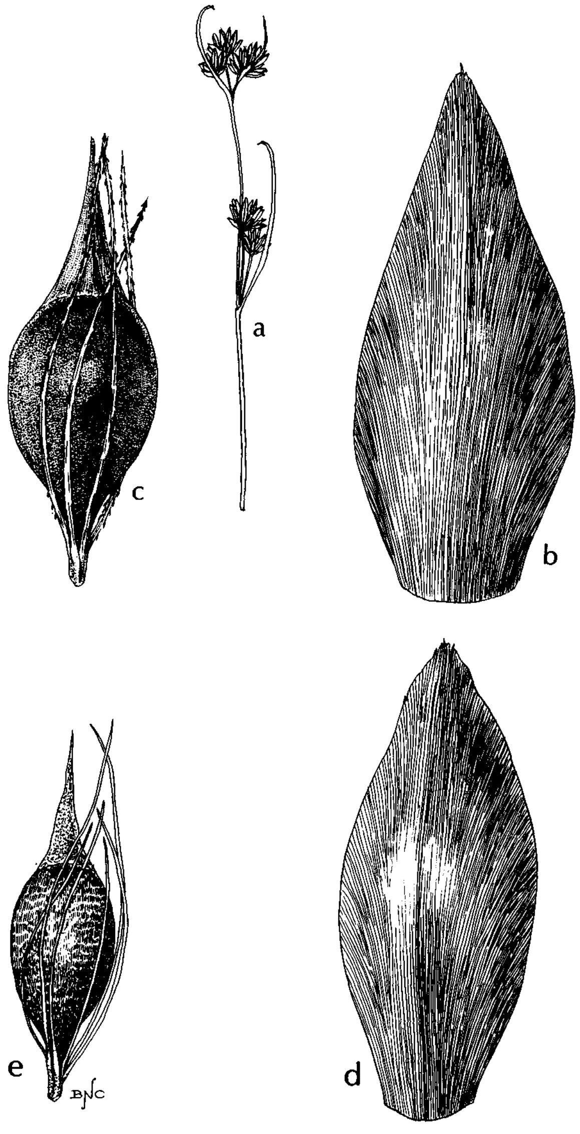

Fig. 223. a–c, **Rhynchospora capitellata:** a, portion of inflorescence; b, scale; c, achene; d–e, **Rhynchospora capillacea:** d, scale; e, achene.

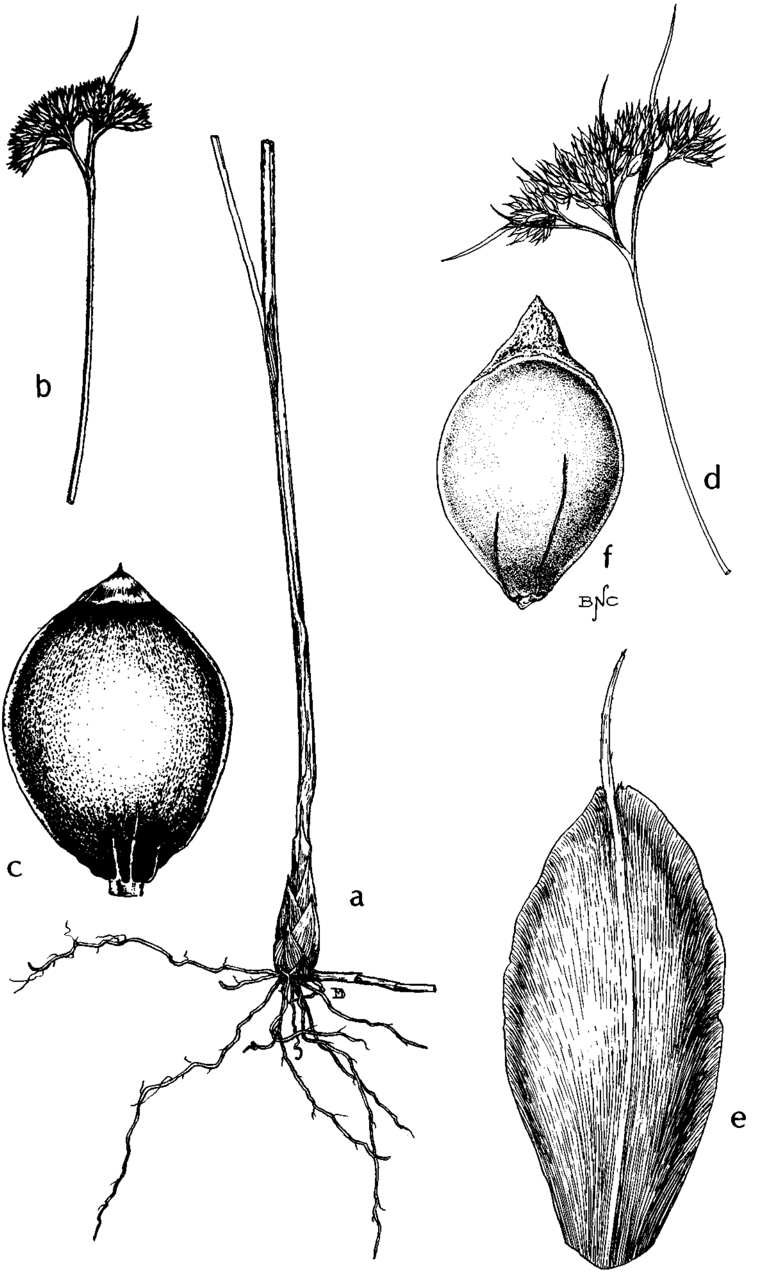

Fig. 224. a–c, **Rhynchospora pallida:** a, base of plant; b, inflorescence; c, achene; d–f, **Rhynchospora chapmanii:** d, inflorescence; e, scale; f, achene.

18. Rhynchospora baldwinii Gray. Fig. 225

Plants usually in small clumps with hard bases. Stems 3-angled, erect, 4–8 dm tall. Leaves somewhat rosettelike, short, little exceeding 1 dm long, mostly 3–5 mm wide, flat or somewhat keeled, long-tapering at the tip. Inflorescence a terminal flat-topped or broadly rounded cluster only, or often with one lateral long-stalked smaller cluster as well. Spikelets usually dark brown, ovate, the scales aristate at their tips, mostly 1–2-fruited. Achene broadly elliptic, 2–2.5 mm long, biconvex, commonly with a pale hump centrally on the face, otherwise dark brown, the surface very minutely pitted; bristles 12, upwardly setose, exceeding the achene but not the deltoid tubercle.

Sandy-peaty soils, seasonally wet pine savannas and flatwoods, adjacent ditches and roadsides. Coastal plain, N.C. to cen. Fla., w. to La.

19. Rhynchospora ciliaris (Michx.) Mohr. Fig. 225

Habit closely similar to the preceding but the leaves with but a short taper at the tip. Inflorescence a single terminal cluster, floral bracts within the cluster conspicuously ciliate. Spikelets ovate, 4–6 mm long, the scales acuminate, 1–2 fruited, chestnut brown to dark brown. Achenes broadly elliptic, subglobose, or slightly obovate, 1.6–1.8 mm long, biconvex and usually with a bit of a pale hump centrally on the face, otherwise chestnut brown, surface finely but noticeably pitted; bristles (4–) 6, easily detached, unequal, the longer not exceeding half the length of the achene; tubercle low, broadly deltoid. (*R. rappiana* Small)

Seasonally wet pine savannas and flatwoods, bogs. Coastal plain, N.C. to s. Fla., w. to La.

20. Rhynchospora debilis Gale. Fig. 226

Stems and leaves filiform-wiry, to 1 mm wide but usually narrower, weakly ascending to reclining, some leaves as long as the flowering stems, to about 5 dm tall. Inflorescences usually in a single terminal cluster, rarely 1 or 2 lateral clusters as well, small, to about 1.5 cm across, mostly less. Spikelets ovate, 2-fruited, dark chestnut brown, scales with an acute but bifid tip, the midrib prolonged between as a bristle. Achene round-ovate to orbicular, biconvex, the face slightly humped centrally and usually pale, otherwise chestnut brown, surface smooth; bristles 5–6, unequal, the longer rarely half the length of the achene; tubercle low, broadly deltoid.

Seasonally wet pine savannas and flatwoods, bogs. Coastal plain, e. Va. to Fla. Panhandle, w. to La.

21. Rhynchospora fascicularis (Michx.) Vahl. Fig. 227

Cespitose perennial, very variable as to height and coarseness, inflorescence structure, and certain achenial characters. Stems slender to stout, 1.5–3.0 mm wide near the base, 4–12 dm tall or slightly taller, obtusely 3-angled, stiffly erect. Leaves mostly 2–4 mm wide, rarely as narrow as 1 mm, flat, often curling, or erect, little if any exceeding half the height of the stem. Inflorescence variable, commonly with a terminal group of unequally stalked clusters and up to at least 6 lateral stalked clusters. Spikelets lanceolate to ovate, 2–3-fruited, chestnut brown, the scales acute, not bifid, the midrib extended as a mucro. Achene elliptic, broadly elliptic, suborbicular to orbicular, about 1.5 mm long, biconvex, the face with or without a central hump, centrally pale and marginally brown or brown to dark brown throughout, surface smooth; bristles 5–6, in some plants unequal and the longest scarcely half the length of the achene, in some plants bristles usually six and well developed, slightly unequal and equalling or exceeding the achene, in an occasional plant the bristles intermediate between the two preceding conditions; tubercle deltoid, sometimes shrunken so that it has an oblong tip. (Incl. *R. fascicularis* var. *distans* (Chapm.) Small)

Moist to wet sandy-peaty soils, pine savannas and flatwoods, cypress-gum depressions, bogs; commonly colonizing moist to wet clearings, roadsides, and ditches. Coastal Plain, s.e. Va. to s. Fla., w. to s.e. Tex., Ark.

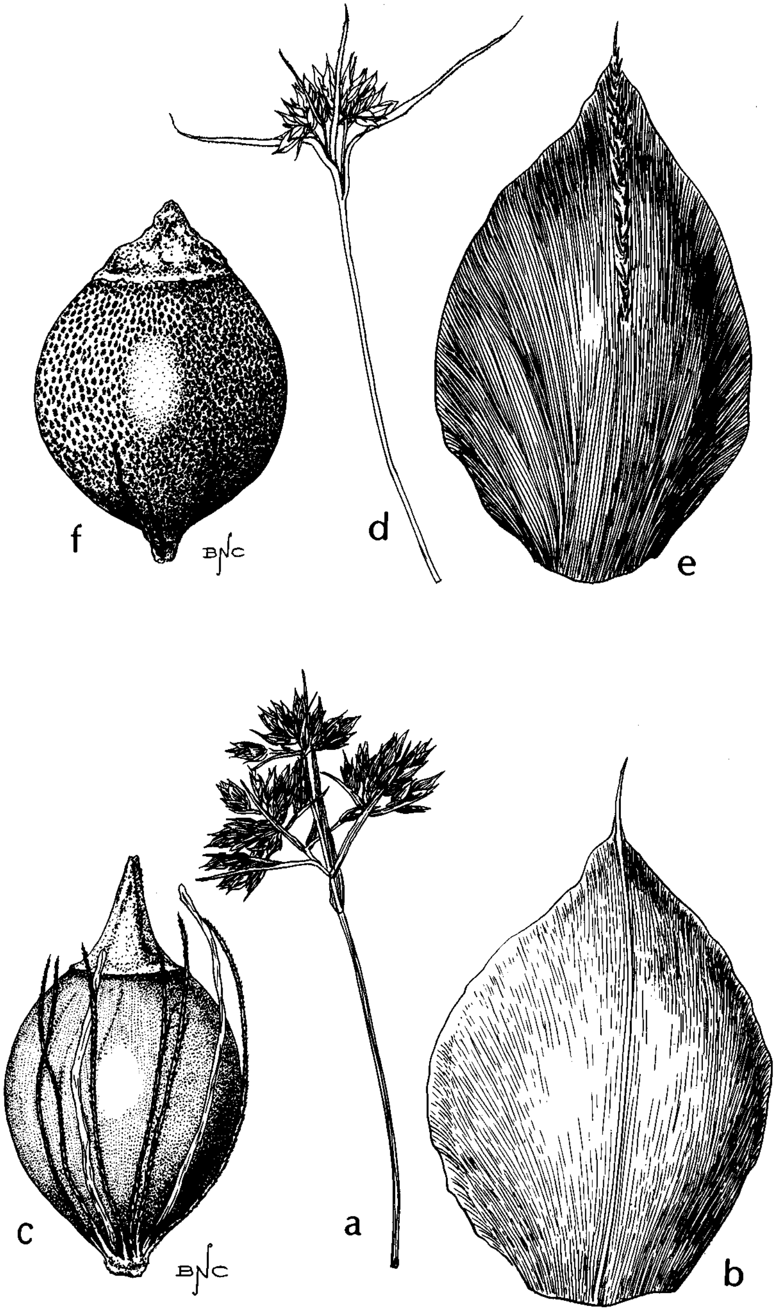

Fig. 225. a–c, **Rhynchospora baldwinii:** a, inflorescence; b, scale; c, achene; d–f, **Rhynchospora ciliaris:** d, inflorescence; e, scale; f, achene.

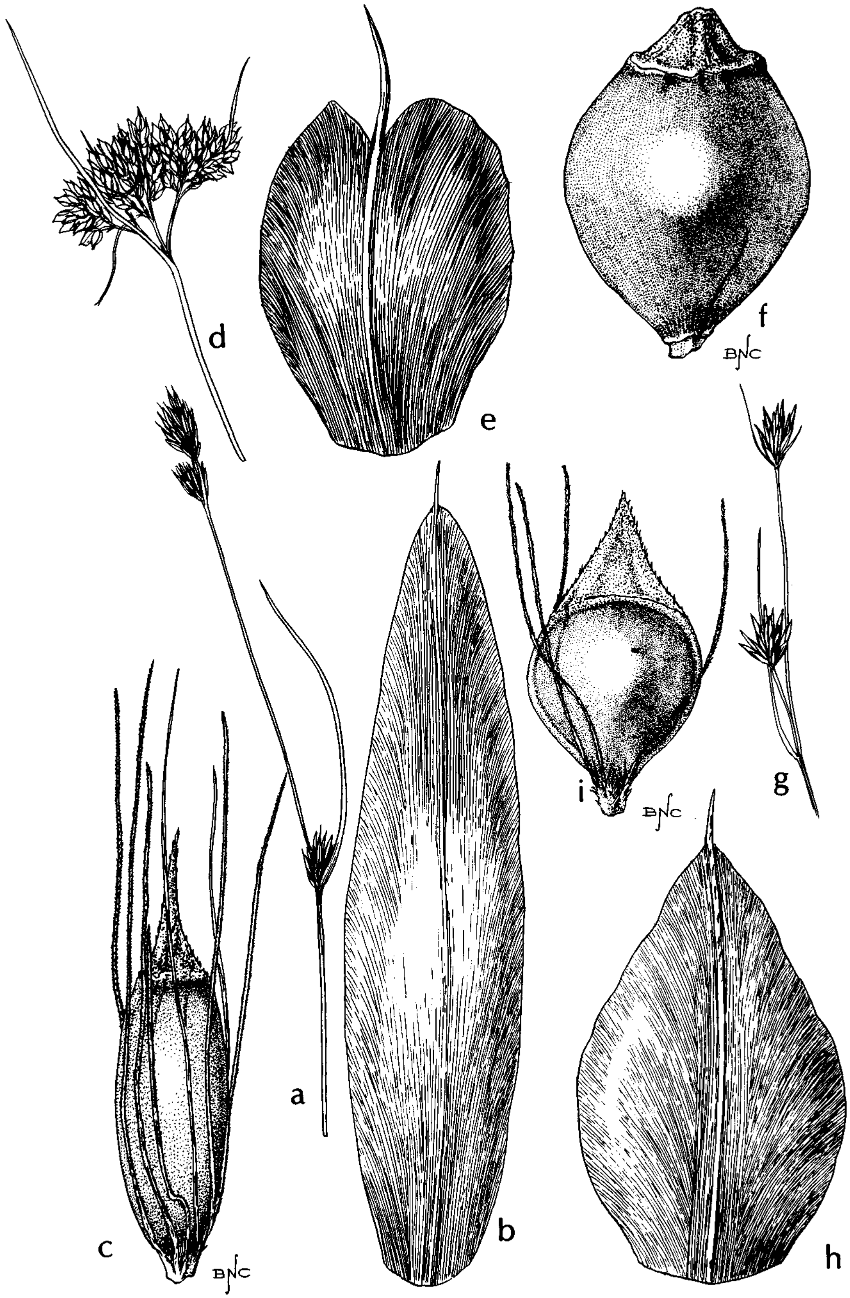

Fig. 226. a–c, **Rhynchospora curtissii:** a, portion of inflorescence; b, scale; c, achene; d–f, **Rhynchospora debilis:** d, portion of inflorescence; e, scale; f, achene; g–i, **Rhynchospora pleiantha:** g, portion of inflorescence; h, scale; i, achene.

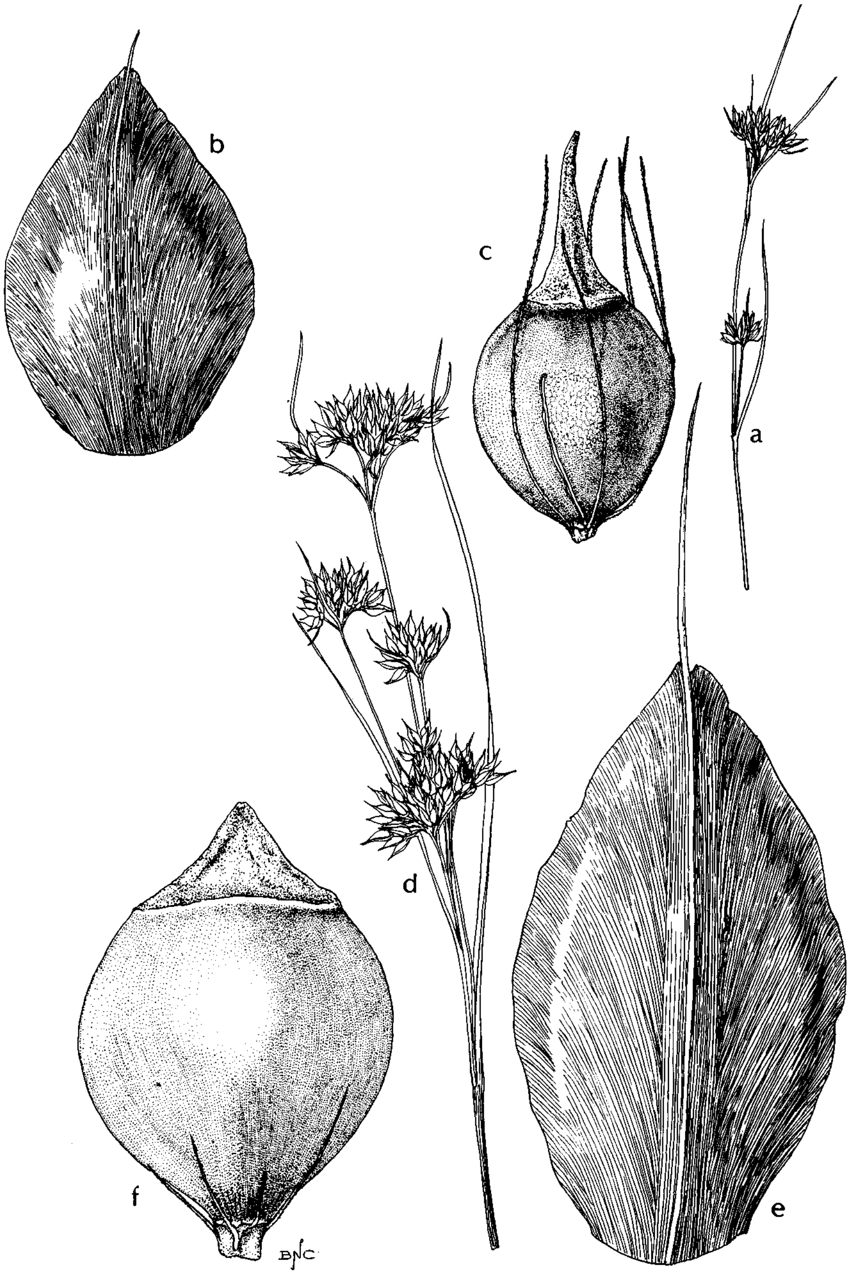

Fig. 227. a–c, **Rhynchospora gracilenta:** a, portion of inflorescence; b, scale; c, achene; d–f, **Rhynchospora fascicularis:** d, portion of inflorescence; e, scale; f, achene.

22. Rhynchospora curtissii Britt. ex Small. Fig. 226

Cespitose perennial. Stems and leaves filiform-capillary. Stems 1.5–3 dm tall, striate. Leaves to 1 mm wide, involute but with blunt flat tips, mostly not exceeding half as high as the flowering stems. Spikelets in terminal and in 2–10 sessile axillary clusters, all ascending in the cluster, now and then one falcate; narrowly lanceolate, 4–6 mm long, 2–3 fruited. Achene narrowly elliptic or elliptic-obovate, smooth, gradually narrowed to a short stipelike base bearing soft hairs among the bases of the bristles, pale or pale centrally on the face and reddish brown marginally; bristles 6, as long as or exceeding the subulate tubercle.

Sandy-peaty soils, seasonally wet pine savannas and flatwoods, adjacent ditches, seepage bogs. Fla. Panhandle to Miss.

This plant very much resembles *R. pleiantha* in respect to stems, leaves and inflorescences. The latter is in small tufts from delicate stolons and may be mat-forming; its achenes are much more definitely obovate, more abruptly narrowed to a stipelike base, and at full maturity are dark reddish brown.

23. Rhynchospora pleiantha (Kükenth.) Gale. Fig. 226

Delicately stoloniferous perennial with small tufts from the stolons and mat-forming. Stems filiform, to about 4 dm tall, nearly terete, striate. Leaves much shorter than the flowering stems, filiform, often curling. Inflorescence a terminal cluster and 1–2 lateral short-stalked clusters just below. Spikelets lanceolate, strongly ascending, 5–6 mm long, light chestnut brown, 2-fruited. Achenes obovate, abruptly narrowed below to a short stipelike base, a tuft of hairs amongst the bristle bases, biconvex, the face not humped, uniformly smooth, dark brown and shiny; bristles 6, upwardly finely serrulate, variable in length, from shorter than to surpassing the triangular-attenuate tubercle.

Sandy or sandy-peaty shores of ponds, sometimes on dry upper margins after water levels have greatly receded. Coastal plain, s.e. N.C. to cen. pen. Fla., Fla. Panhandle, s.e. Ala.; Cuba.

24. Rhynchospora gracilenta Gray. Fig. 227

Cespitose perennial. Stem terete, striate, slender, often filiform, 3–10 dm tall. Leaves slender, often filiform, to 2.5 mm wide, some, at least, often as long as the flowering stems. Inflorescence a terminal, often branched, cluster, to 3 cm across, commonly 1 (–2 or –3) lateral stalked clusters some distance below. Spikelets ascending, ovate to ovate-lanceolate, chestnut brown, 1–2-fruited, 3–6 mm long. Achene oval, broadly elliptic to suborbicular, broadest at the middle, 1–2 mm long, biconvex, smooth, the face with a central usually pale hump, otherwise dull dark brown; bristles 6, upwardly minutely setose, as long as the tubercle or nearly so; tubercle subulate, to 1–2 mm long.

Bogs, sandy-peaty depressions in pine savannas and flatwoods, evergreen shrub bogs. Coastal plain, N.J. to n. Fla., w. to e. and s.e. Tex.; Ark., Tenn.

25. Rhynchospora filifolia Gray. Fig. 228

Cespitose perennial. Stems and leaves filiform, flexuous, mostly not over 1 mm wide, the leaves exceeded by the flowering stems. Inflorescence terminal and with 1–2 laterals, tubinate or round-topped, to 2 cm across. Spikelets few to many per cluster, ovoid-lanceolate, 3–4 mm long, 1–4-fruited, brown. Achenes obovate, sometimes narrowly, biconvex, about 1 mm long, narrowed at the base, commonly with a stipelike base clothed with hairs, surface smooth and glossy, when mature the face with a prominent pale circular central portion, brown marginally (this not usually evident before final ripening); bristles 6, minutely upwardly serrulate, nearly as long as the tubercle or surpassing it; tubercle deltoid-attenuate.

Sandy-peaty soils, depressions in pine savannas and flatwoods, adjacent ditches, in bogs, shores of ponds and lakes, often where high and dry after water levels have receded; commonly abundant in moist to wet clearings as a colonizer. Coastal plain, N.J. to s. cen. Fla., w. to e. Tex.; Cuba.

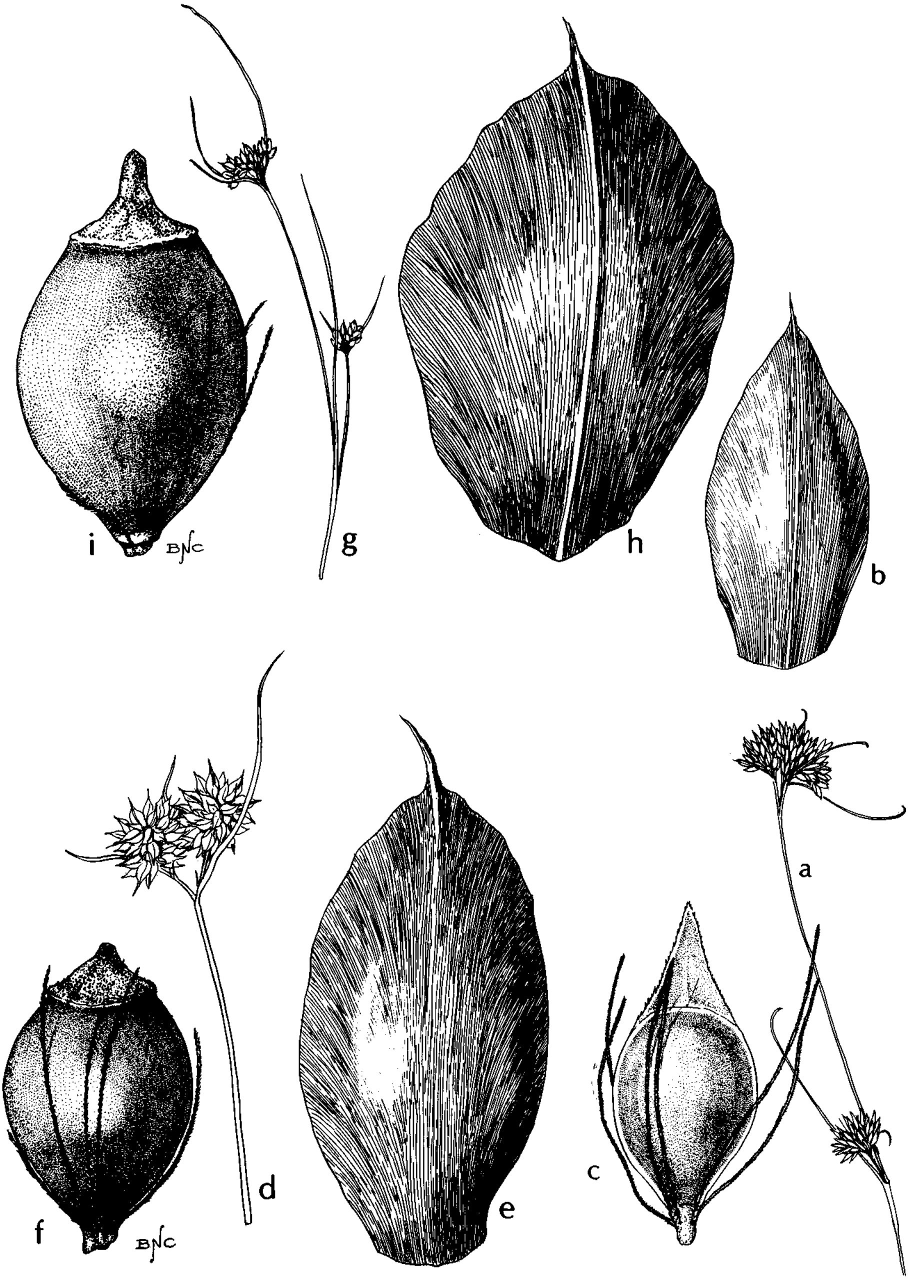

Fig. 228. a–c, **Rhynchospora filifolia:** a, portion of inflorescence; b, scale; c, achene; d–f, **Rhynchospora fernaldii:** d, portion of inflorescence; e, scale; f, achene; g–i, **Rhynchospora wrightiana:** g, portion of inflorescence; h, scale; i, achene.

Gale distinguishes two additional species, presumably closely allied to *R. filifolia*, namely *R. crinipes* Gale (occurring only at Mobile, Ala.) and *R. harperi* Small (occurring in a few widely scattered localities in Ga., Fla., and Ala.). The material at hand and from which we have drawn our description of *R. filifolia* probably includes specimens identifiable as *R. crinipes* or *R. harperi*; if so we have failed in an attempt to delimit three distinct taxa.

26. Rhynchospora fernaldii Gale. Fig. 228

Cespitose perennial. Stems narrow, mostly 3–4 dm tall, stiffly erect, striate. Leaves narrow and attenuate, 1–1.5 mm wide, mostly stiffly erect, usually not exceeding half the length of the flowering stems. Inflorescence usually a single terminal cluster, occasionally with a lateral cluster as well, the clusters round-topped, 0.5–1.5 cm across, dark brown; spikelets ovoid, 2–2.5 mm long, 2–3-fruited. Achenes biconvex, elliptic to slightly obovoid, about 1 mm long, smooth, dark brown or sometimes the face centrally pale; bristles 6, little exceeding the achene body or somewhat shorter, often unequal; tubercle deltoid, low.

Flatwoods depressions. S. Ga., to cen. pen. Fla., w. to s. Ala.

27. Rhynchospora wrightiana Boeckl. Fig. 228

Cespitose perennial. Stems and leaves filiform-wiry, mostly less than 1 mm wide, to 4.5 dm tall, striate, flexuous and tending to be loosely spreading or reclining, the leaves commonly equalling the flowering stems. Inflorescences a terminal cluster and commonly 1–2 lateral stalked clusters, few spikelets per cluster, 1–2-fruited, the clusters seldom as much as 1 cm across. Spikelets ovoid-lanceolate, 3–3.5 mm long. Achenes biconvex, elliptic, smooth, 1.3–1.5 mm long, dark brown or sometimes with a centrally pale portion on the faces; bristles 6, usually unequal, the longer equalling the achene body; tubercle compressed-triangular, usually short-straplike above the base, 0.6–0.8 mm long.

Commonly on exposed shores of ponds, in cypress ponds, depressions in pine savannas and flatwoods. Coastal plain, s.e. N.C. to cen. pen. Fla., w. to s. Ala.; Cuba, P.R.

28. Rhynchospora pusilla Chapm. ex M. A. Curtis. Fig. 229

Tightly tufted, very much resembling plants of certain species of *Bulbostylis*. Stems and leaves capillary, mostly not over 0.5 mm wide, more or less striate, 15–30 cm tall. Spikelets in terminal and axillary loose-cymose clusters, to 2.5 cm across, ovate or lance-ovate, 2–2.5 mm long, 5–8-fruited (though only 2 or so visible at a given time), light chestnut brown. Achenes tiny, biconvex, 0.6–0.8 mm long, obovate, bony-whitish or -yellowish, the surfaces transversely ridged-reticulate; bristles none; tubercle skullcap-like. (*R. intermixta* Wright)

Pine savannas and flatwoods, moist to wet sandy and peaty sands, often on alluvial outwash, and in swamp clearings. Coastal plain, N.C. to s. Fla., w. to e. Tex.; W.I.

29. Rhynchospora divergens Chapm. ex M. A. Curtis.

Very similar to *R. pusilla*. Spikelets on the average more slender and lanceolate, 2–4 mm long. Achenes similar but tending to be plumper, i.e., more turgidly biconvex, the surfaces without transverse ridges, the surface proper usually smooth but an underlying reticulation showing through (with suitable magnification).

Cypress or cypress-gum depressions and ponds, interdune swales, bogs, marl prairies, depressions in pine savannas and flatwoods; commonly on wetter sites or sites subject to greater seasonal flooding than for *R. pusilla*. Coastal plain, S.C. to s. Fla., w. to s.e. Tex.; Bah. Is.

30. Rhynchospora rariflora (Michx.) Ell. Fig. 229

Tussocked perennial. Stems and leaves capillary or filiform-wiry, striate; stems of uneven lengths, to 5–6 dm tall, flexuous, often spreading or reclining; longer leaves to

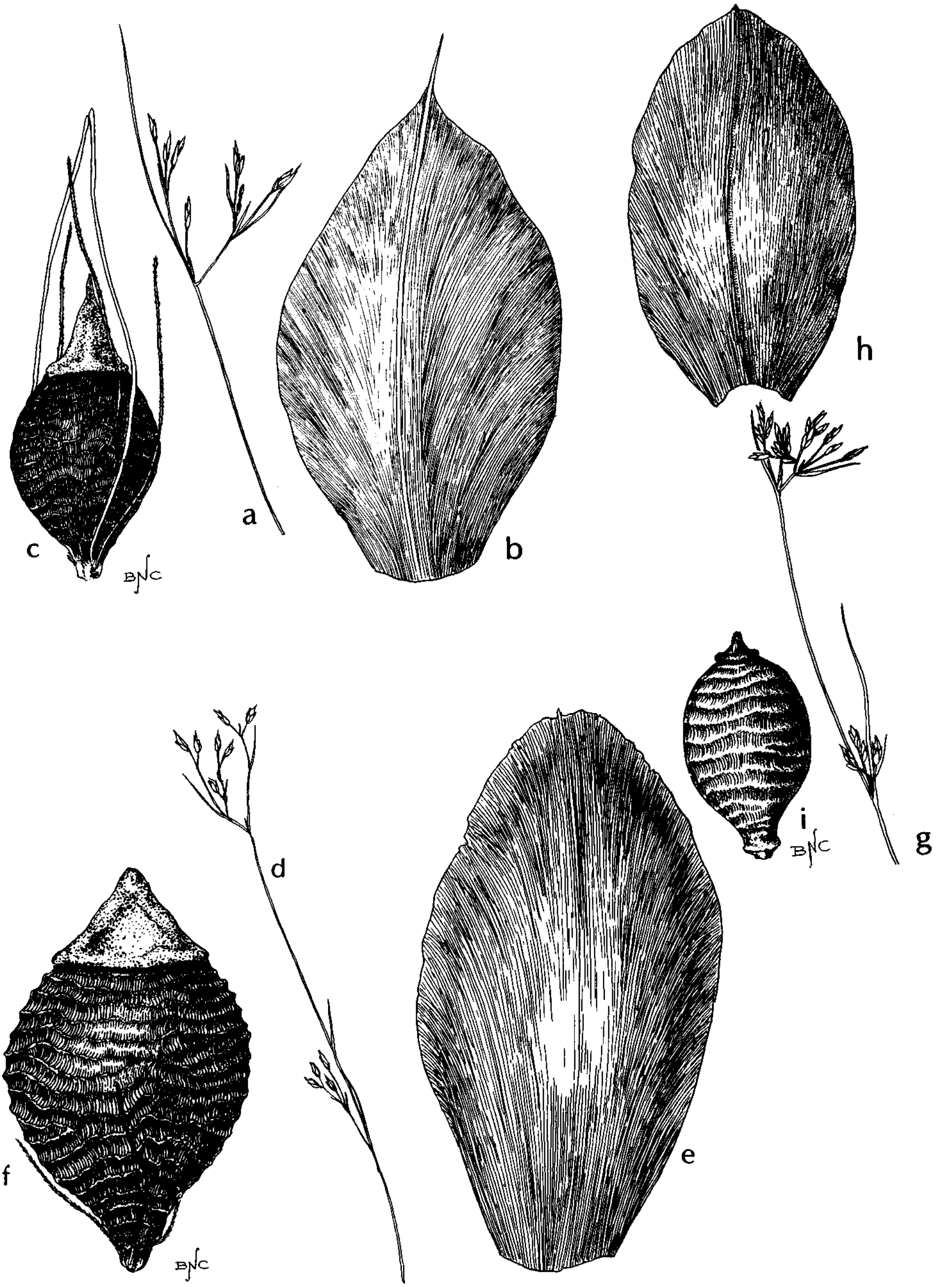

Fig. 229. a–c, **Rhynchospora stenophylla:** a, inflorescence; b, scale; c, achene; d–f, **Rhynchospora rariflora:** d, inflorescence; e, scale; f, achene; g–i, **Rhynchospora pusilla:** g, inflorescence; h, scale; i, achene.

about half the length of the longer flowering stems. Spikelets in loose subcymose terminal clusters, some sometimes sessile, mostly each on a capillary stalk, the clusters to 3 cm across; ovoid, 3–4 mm long, chestnut brown, 1–3-fruited. Achenes obovate, biconvex, the body about 1.5 mm long, transversely ridged-reticulate; bristles 6, unequal, from half as long to nearly as long as the achene body; tubercle deltoid-compressed to deltoid-conical.

Bogs, cypress-gum ponds, sandy-peaty shores, depressions in pine savannas and flatwoods. Coastal plain, N.J. to s. Fla., w. to e. and s.e. Tex.; Tenn.; W.I., C.Am.

31. **Rhynchospora stenophylla** Carey ex Chapm. Fig. 229

Similar to *R. rariflora.* Spikelets lanceolate, usually falcate, 5 mm long, 1-fruited. Bristles 6, mostly equalling or even exceeding the deltoid-acuminate or deltoid-subulate tubercle.

Rare, bogs and semiboggy situations. Coastal plain, s.e. N.C. to Fla. Panhandle, thence to s. Miss.

32. **Rhynchospora inexpansa** (Michx.) Vahl. Fig. 230

Cespitose perennial. Stems and leaves relatively coarse, the stems to 1 m tall, the lower leaves much shorter than the flowering stems and to 4 mm wide, flat. Inflorescences of terminal and 1–4 lateral cymes, all on flexuous, commonly drooping stalks, overall each usually loose-turbinate. Spikelets lanceolate to fusiform, 7–9 mm long, brown, 1–4-fruited. Achenes narrowly elliptic-obovate, chestnut brown, the faces flat, surficially transversely ridged-reticulate; bristles 6, much surpassing the tubercle; tubercle deltoid-subulate, setose on the margins.

Wet to dry sands and peaty sands, bogs, pine savannas and flatwoods, shores of ponds, commonly abundantly colonizing roadsides and ditches. Coastal plain, s.e. Va. to n. Fla. (where rare), w. to e. and s.e. Tex., Ark.; Cuba and Hisp.

33. **Rhynchospora compressa** Carey ex Chapm. Fig. 230

Cespitose perennial with stout hard caudices. Superficially similar to stout specimens of *R. globularis.* Stems stiffly erect to 1 m tall. Leaves numerous on the thick lower stems, much shorter than the flowering stems, to 6 mm wide, flat. Inflorescences in stiffly erect terminal and long-stalked axillary several-storied cymes. Spikelets ovate, 1–2-fruited, dark chestnut brown. Achenes obovate to broadly elliptic, but narrowing apically, about 1.5 mm long, dark reddish brown, the faces flat or centrally sunken, transversely ridged-reticulate; bristles 6, usually unequal, the longer nearly equalling the achene body; tubercle with a circular, flat platelike base, its periphery extending outward over the narrowed summit of the achene, conical above the base.

Apparently infrequent, pine savannas and flatwoods, open bogs. S. Ga., n. Fla., to La.

34. **Rhynchospora perplexa** Britt. ex. Small. Fig. 231

Cespitose perennial. Stems to about 1 m tall, flexuous but not filiform or wiry. Leaves flat, 1–2 mm wide, the lower much exceeded by the flowering stems. Inflorescences terminal and 1–3 lateral flexuous-stalked cymes with filiform branches of unequal length. Spikelets ovate, dark brown, several-fruited, the scales and achenes both falling gradually. Achenes broadly elliptic to obovate, about 1.0 mm long, the faces flat; surficially transversely ridged-reticulate, the major ridges somewhat truncated, usually 8 or less, reflecting light rather markedly, bristles 1–3, rarely to 6, or none, usually unequal, the longer little exceeding half the length of the achene; tubercle low, broadly deltoid.

Depressions in pine savannas and flatwoods, cypress-gum ponds, open sandy-peaty shores, often in shallow water at least temporarily. Coastal plain, s.e. Va. to s. Fla., w. to Tex.; Gr. Ant.

R. perplexa and *R. microcarpa* are superficially much alike. Achenes of the latter

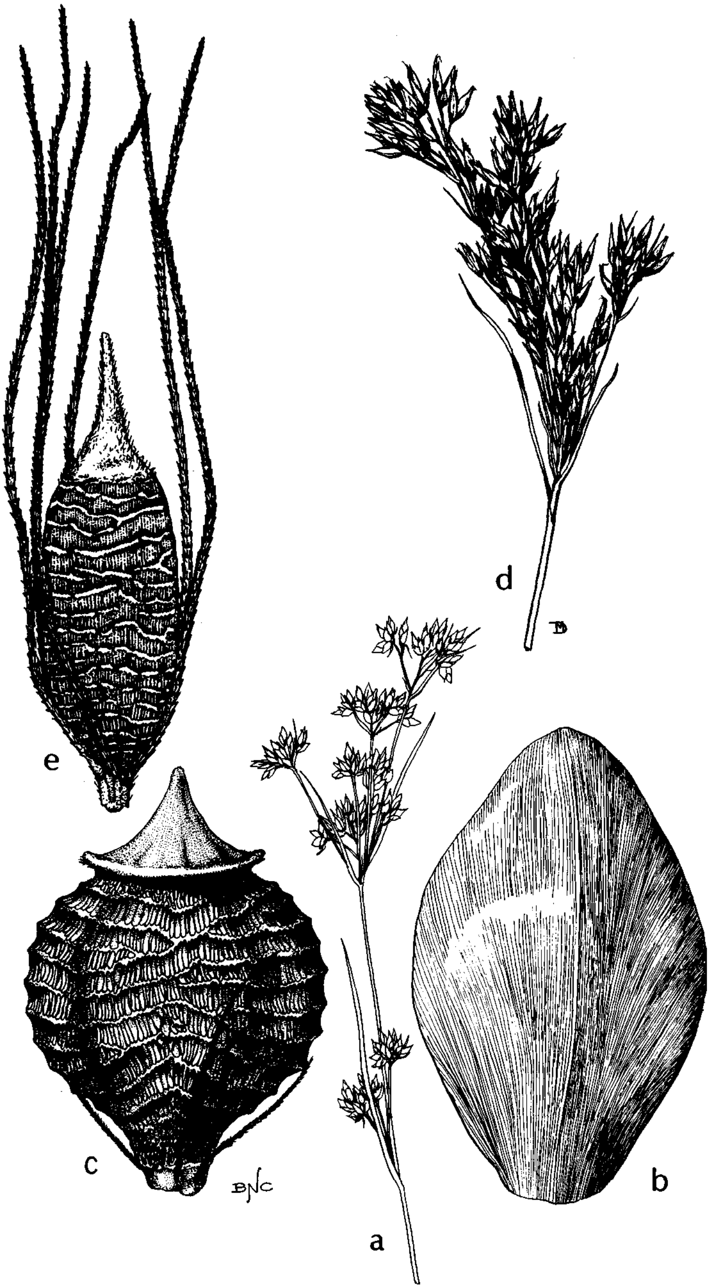

Fig. 230. a–c, **Rhynchospora compressa:** a, portion of inflorescence; b, scale; c, achene; d–e, **Rhynchospora inexpansa:** d, portion of inflorescence; e, achene.

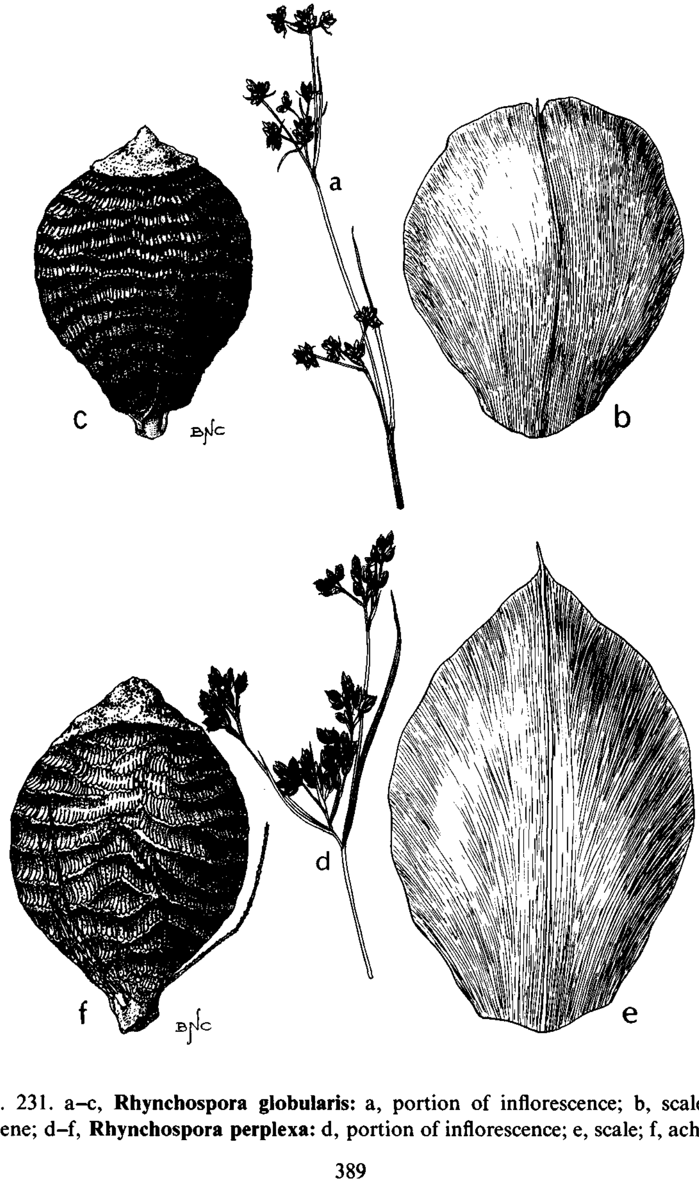

Fig. 231. a–c, **Rhynchospora globularis:** a, portion of inflorescence; b, scale; c, achene; d–f, **Rhynchospora perplexa:** d, portion of inflorescence; e, scale; f, achene.

have biconvex faces rather than flat ones, the outline shape more strongly obovate, the horizontal ridges on the achene sharper on the average thus not reflecting light so pronouncedly. The perianth bristles of *R. microcarpa* seem always to be 6 though from specimen to specimen they vary in length from half the length of the achene body to equalling the tubercle.

35. Rhynchospora torreyana Gray. Fig. 232

Cespitose perennial. Stems moderately coarse, to 1 m tall, flexuous above. Leaves mostly in basal tufts, much shorter than the flowering stems, flat, 2–3 mm wide. Inflorescences in terminal and lateral stalked tubinate cymes, the primary and secondary stalks filiform and flexuous. Spikelets mostly stalked, lanceolate or narrowly ovate and long-tapering, light chestnut brown to brown, 4–6 mm long, 1–5-fruited. Achenes oblong-obovate, the faces flat or nearly so, finely transversely ridged-reticulate, the ridges usually 1 or more; bristles 6, easily detached, somewhat unequal, to half the length of the achene body or slightly more; tubercle low, broadly deltoid, essentially extending over the summit of the achene.

Pond margins, pine savannas and flatwoods, clearings of shrub bogs, hillside bogs. Coastal plain, Mass. to Ga.

36. Rhynchospora elliottii A. Dietr. Fig. 233

Cespitose perennial, the caudices coarse, basal offshoots somewhat spreading. Stems relatively coarse, to 5 mm thick, to 1.5 m tall, the upper stems commonly nodding. Lower leaves much shorter than the flowering stems, to 5–6 mm wide. Inflorescence relatively large, terminal, and 1–several stalked lateral, congested decompound cymes. Spikelets ovate, dark brown, 2–3 mm long, 2–4-fruited. Achenes obovate, 1.2–1.3 mm long, the faces flat or nearly so, sometimes sunken, markedly transversely ridged-reticulate, the ridges usually about 10; bristles 6, surpassing the tubercle in length (see note below) but tending not to be straight-erect, rather irregularly arching outward from the base then ascending; tubercle small, deltoid. (*R. schoenoides* (Ell.) Wood)

Sandy-peaty or peat soils, cypress-gum ponds, or depressions, depressions in pine savannas or flatwoods, often colonizing ditches or disturbed places. Coastal plain, N.C. to Fla. Panhandle, w. to e. and s.e. Tex.

Note: *R. punctata* Ell., apparently a very rare plant of wet pine barrens of s.e. Georgia and n.e. Florida, does not resemble *R. elliottii* in habit; rather it is much more like *R. globularis*, especially in its stiff-cymose inflorescence. Achenes of *R. punctata* are much larger than those of *R. elliottii*, 2 mm long or slightly longer, but as in the latter their faces are flat or even sunken; perianth bristles of *R. punctata* extend to about half the length of the tubercle rather than exceeding it as in *R. elliottii.* Gale cites only two specimens of *R. punctata*; we have seen a third from approximately the same Georgia locality (Coffee Co.) as one of the two cited by her.

37. Rhynchospora harveyi W. Boott. Fig. 234

Cespitose perennial. Stems to 6 dm tall. Lower leaves to about half the height of the flowering stem, 2–4 mm wide. Inflorescence a terminal cyme, sometimes with laterals, the ultimate branches bearing glomerate spikelets. Spikelets ovate, light brown, 2.5–3 mm long, mostly 1-fruited. Achenes obovate, 1.5–1.8 mm long, turgidly biconvex, at maturity rich mahogany brown to almost black, surface minutely cancellate with isodiametric cells; bristles 5–6, less than half the length of the achene body; tubercle low, squat-conic, usually with a distinctly textured cartilaginous or crustaceous rim at its base. (*R. earlei* Britt. ex Small)

Moist to well-drained sites, open pinelands, sometimes in depressions where water stands temporarily. Coastal plain, s.e. Va. to n. Fla., w. to Tex., Okla., Mo. and Tenn.

Note: *R. saxicola* Small, a plant restricted to granite outcrops in the piedmont of Georgia, has a dark brown, biconvex achene, perianth bristles somewhat unequal, the longer equalling the achene body or longer; surficially the achene is ridged-reticulate, the ridges cartilaginous; tubercle is low-caplike and not at all rimmed at the base.

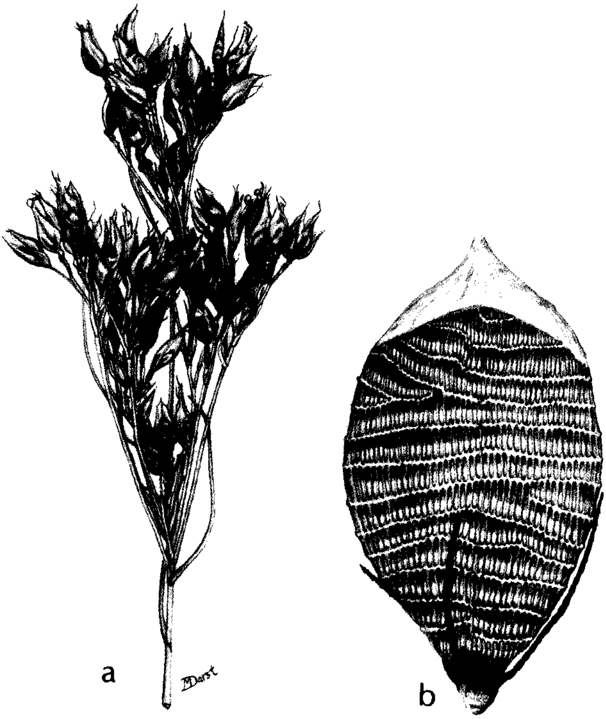

Fig. 232. **Rhynchospora torreyana:** inflorescence and achene.

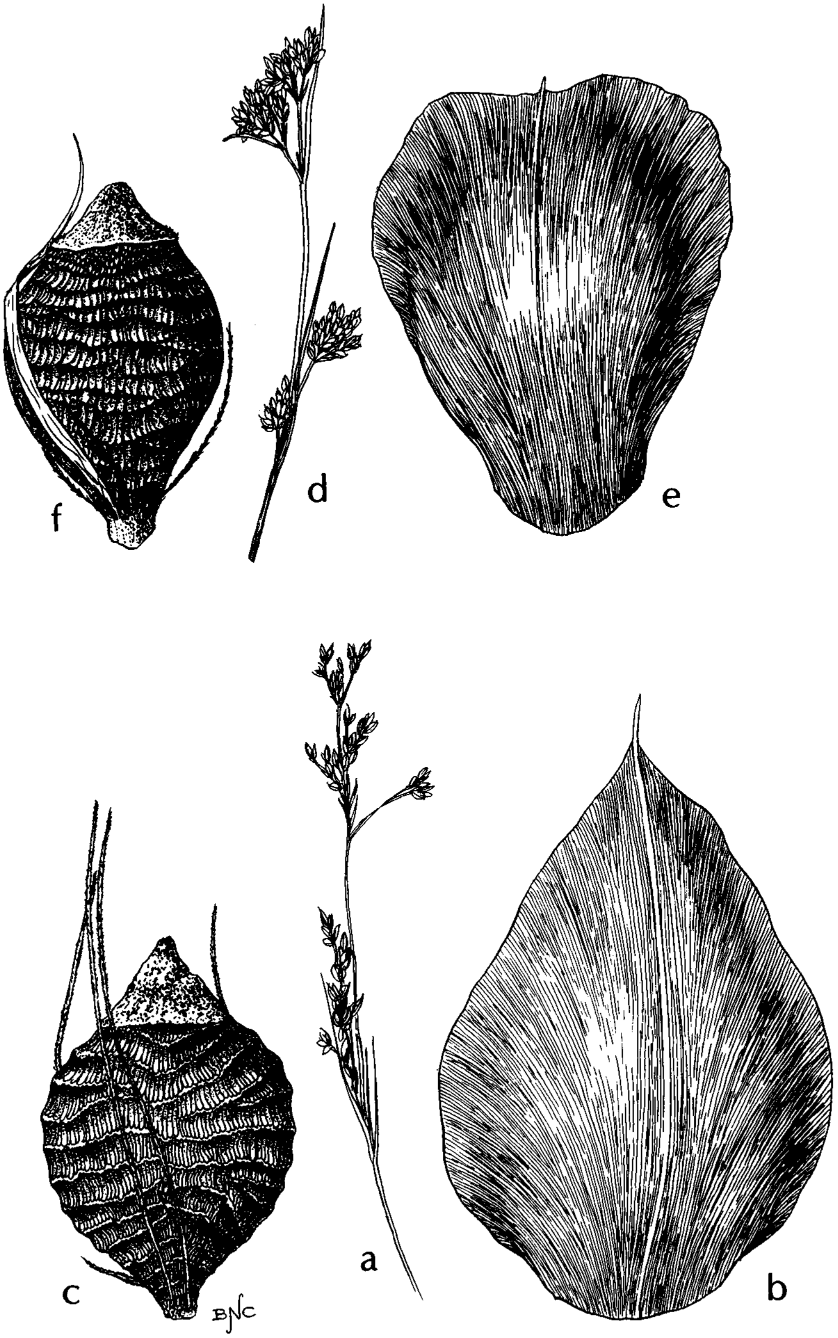

Fig. 233. a–c, **Rhynchospora elliottii:** a, portion of inflorescence; b, scale; c, achene; d–f, **Rhynchospora microcarpa:** d, portion of inflorescence; e, scale; f, achene.

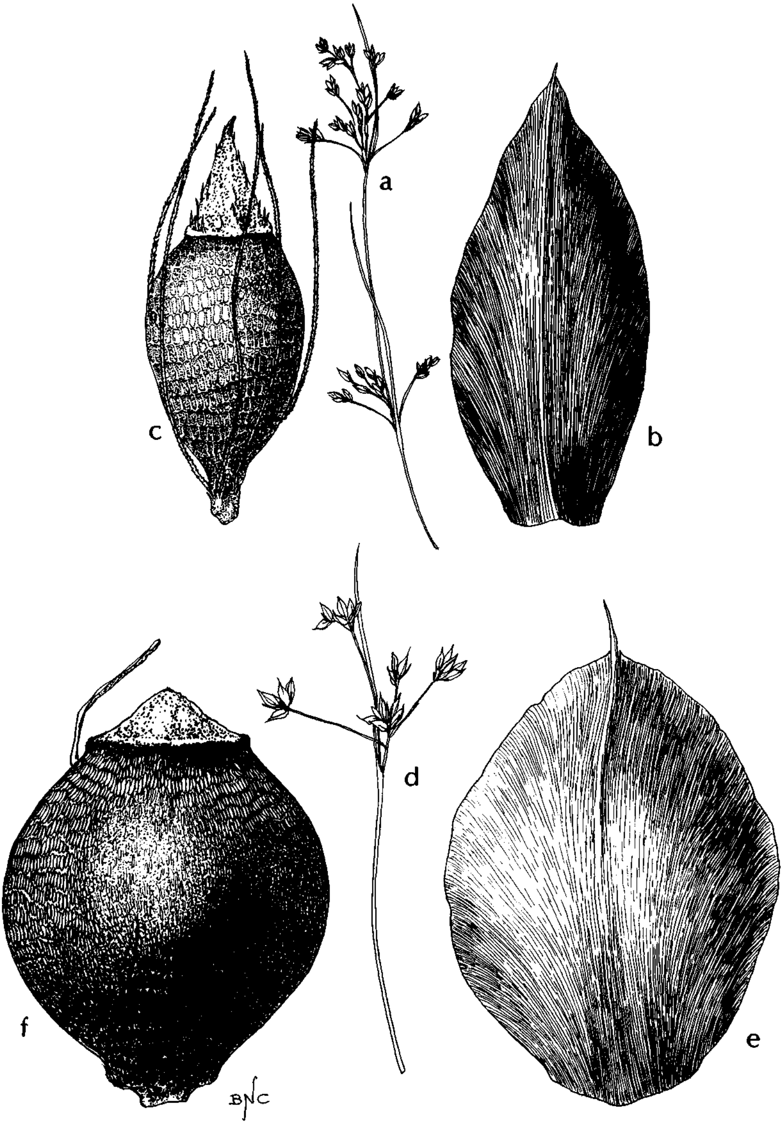

Fig. 234. a–c, **Rhynchospora mixta:** a, portion of inflorescence; b, scale; c, achene; d–f, **Rhynchospora harveyi:** d, portion of inflorescence; e, scale; f, achene.

Two species not here included, *R. grayii* Kunth and *R. megalocarpa* Gray (*R. dodecandra* Baldw. ex Gray), neither of which occur in wet lands, have some characteristics in common with *R. harveyi* and would likely key out with it.

38. Rhynchospora globularis (Chapm.) Small, var. **globularis.** Fig. 231

Cespitose perennial, stature very variable. Stems from about 1.5–10 dm tall, 1.0–2.5 mm across near the base. Leaves mostly short but occasionally half the length of the flowering stem, flat, 1.5 mm wide. Inflorescences stiffly ascending, loose to glomerate cymes, both terminal and lateral. Spikelets ovate, 2.5–4 mm long, light to dark brown, 1–3-fruited. Achenes obovate, the body 1.6–2.0 mm long, biconvex and at maturity bulged or humped on the upper face, the surface transversely ridged-reticulate (or in the var. *pinetorum* evenly cancellate with isodiametric cells and not transversely ridged); bristles usually 5–6, unequal, the longer less than half to ⅔ the length of the achene; tubercle conical. (*R. cymosa* Ell.; *R. obliterata* Gale; *R. globularis* var. *recognita* Gale)

Moist to wet sandy or sandy-peaty soils, pine savannas and flatwoods, pond margins, swales, commonly colonizing adjacent disturbed sites, ditches and roadsides. N.J. to s. Fla., w. to cen. Tex., Okla., Tenn. and Mo.; Calif.; W.I. and C.Am.

R. globularis var. *pinetorum* (Small) Gale appears to have an achene whose surface is distinctive (see above); otherwise the plant is like the var. *globularis.* It occurs within the range of the latter from Fla. to La. and in Cuba and Jamaica.

In general appearance some specimens of *R. globularis* are very much like some specimens of *R. microcarpa* (as we understand both).

39. Rhynchospora microcarpa Baldw. ex Gray. Fig. 233

Cespitose perennial. Variable in stature, to 1 m tall. Leaves flat, 2–4 mm wide. Many specimens superficially resembling plants of *R. elliottii* but with much less robust caudices; some specimens superficially similar to certain variants of *R. globularis.* Inflorescences very variable, some with very many spikelets in diffuse decompound cymes, terminal and lateral, these most like those of *R. elliottii*; others have small terminal and lateral cymes very much like those of some plants of *R. globularis.* Spikelets ovate or lance-ovate, dark brown, 2.5–4 mm long, 2–3-fruited. Achenes obovate, biconvex, 1.0–1.2 mm long, the surface transversely narrowly ridged-reticulate; bristles 6, half as long as the achene body to as long as the tubercle; tubercle deltoid. (*R. edisoniana* Britt.)

Pond shores, cypress-gum pond margins, depressions in pine savannas and flatwoods, colonizing moist to wet sandy-peaty clearings, ditches and roadsides. Coastal plain, N.C. to s. Fla., w. to Tex.; Bah. Is., Cuba, P.R., Hisp.

Perhaps (probably) what Gale described as *R. sulcata* Gale is included in our treatment of *R. microcarpa.* Although, as here treated, the latter is a variable assemblage, we do not feel warranted in "breaking it up." Authors have not, to our knowledge, suggested hybridization in *Rhynchospora* to account for some of the variability. We wonder! In the case of *R. sulcata*, it is worth noting that Gale places it in her series Globulares but states that it is closely related both to *R. brittonii* Gale (of Cuba), also in series Globulares, and to *R. microcarpa* in her series Caducae.

40. Rhynchospora miliacea (Lam.) Gray. Fig. 235

Stoloniferous perennial. Stems to 1 m tall. Leaves long, flat, to 1 cm wide. Inflorescence very distinctive: in broad divaricate decompound cymes from 3–10 cm across, mostly 6–7 per stem, widely spaced; principal branches of each cyme long-filiform, slightly ascending to slightly reflexed, subumbellate above the middle, the ultimate unequal stalks usually bearing a single spikelet. Spikelets ovate, 2.5–3 mm long, light brown. Achenes obovate, turgidly biconvex, mostly 1.2–1.3 mm long, pale greenish yellow or yellow, the surface finely ridged-reticulate; bristles 6, irregularly spreading-ascending, exceeding the squat conic-apiculate tubercle.

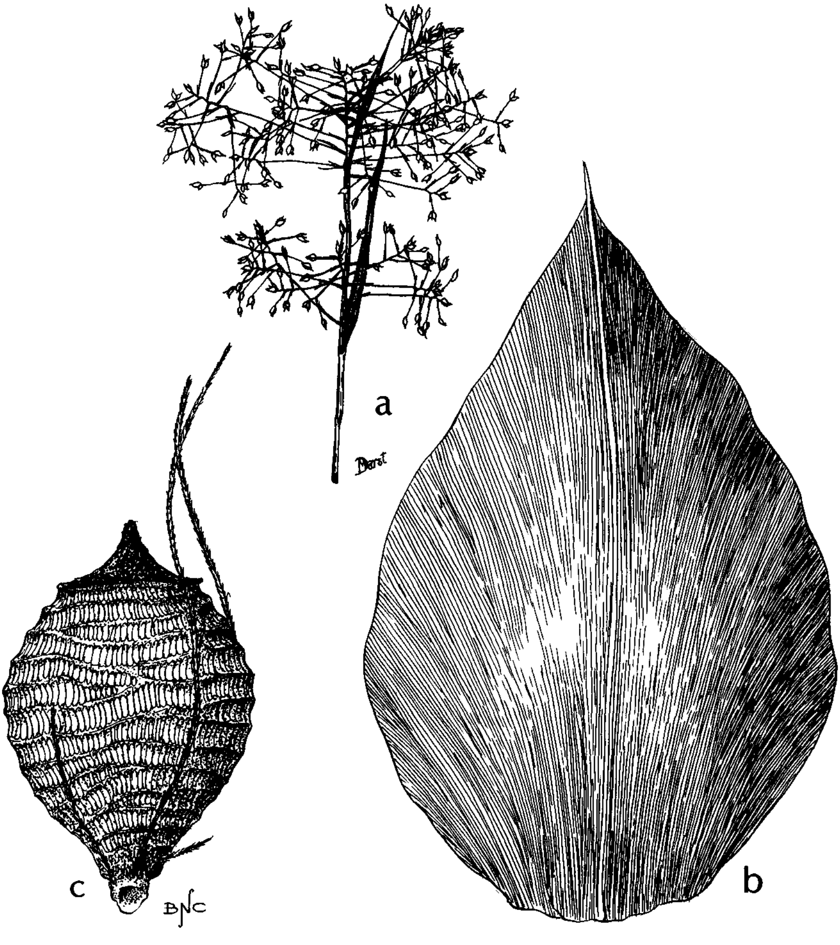

Fig. 235. **Rhynchospora miliacea:** a, summit of an elongate inflorescence; b, scale; c, achene.

In wooded places, floodplain forests, swamps, wet hammocks and woodlands, cypress-gum ponds and swamps, marshy shores of streams. Coastal plain, s.e. Va. to s. Fla., w. to La.; Cuba and Hisp.

41. Rhynchospora odorata C. Wright ex Griseb. Fig. 236

Perennial with short slender rhizomes. Stems moderately stocky below, flexuous above. Leaves usually elongate, flat or keeled, 3–6 mm wide. Inflorescences of a terminal and 1–3 (–5) lateral turbinate, often arched, decompound cymes, the latter with few–many spikelets. Spikelets ovate, 6–9 mm long, brown, usually several-fruited. Achenes suborbicular to obovate, strongly biconvex, often with a central bulge on the upper face, with a persistent stipe below the insertion of the bristles, the surface shallowly ridged-reticulate; bristles 6, exceeding the deltoid tubercle. (*R. stipitata* Chapm.)

Swamp forests, cypress ponds or flats, open sandy-peaty depressions, marshy borders of streams. Coastal plain, N.C. to s. Fla.; Berm., Bah. Is., Gr. Ant.

42. Rhynchospora decurrens Chapm. Fig. 236

Cespitose perennial. Stems slender, to about 1 m tall, very flexuous above. Leaves elongate, flat and soft, 2–3 mm wide. Inflorescences of a terminal and 3–5 (–7) lateral, loose, lax, decompound cymes, the spikelets borne singly or in small glomerules on ascending capillary stalks. Spikelets ovate to broadly fusiform, light to dark brown, 3 mm long, 2–3-fruited. Achenes elliptic or elliptic-obovate, slightly biconvex, 1.3 mm long, the surface finely transversely ridged-reticulate; bristles 6, slender, easily detached, equalling the achene body; tubercle broadly deltoid.

Swamp forests and marshy shores. Coastal plain, N.C. to s. Fla.

43. Rhynchospora caduca Ell. Fig. 237

Perennial with short rhizomes. Stems thickish basally, flexuous above, to 1.2 m tall. Leaves elongate, 3–7 mm wide, flat or slightly keeled. Inflorescences of a terminal and 3–4 lateral decompound cymes, variable in size but commonly with very numerous spikelets. Spikelets ovate, dark brown, 4–4.5 mm long, 2–5-fruited. Achenes obovate to suborbicular, 1.4–1.6 mm long, biconvex and usually with a central bulge on the upper face, surface horizontally ridged-reticulate, the cells vertically elongated; bristles 6, surpassing the tubercle; tubercle deltoid, acute, the margins setose. (*R. patula* Gray)

Wet woodlands, wet sands and peats of bogs and clearings, depressions of pine savannas and flatwoods. Piedmont and coastal plain, Va. to s. Fla., w. to e. and s.e. Tex., Ark., Okla.

44. Rhynchospora mixta Britt. ex Small. Fig. 234

Rhizomatous perennial. Stems relatively slender, flexuous above, to about 1 m tall. Leaves elongate, 3–4 mm wide, flat. Inflorescence of a terminal and 4–5 lateral decompound loose cymes, the principal branches capillary and widely spreading to ascending. Spikelets borne singly or in small glomerules on the ultimate capillary stalks, ovate, brown, 4–4.5 mm long, 1–several-fruited. Achenes elliptic-obovate, about 1.4 mm long, biconvex, the surface honeycombed with nearly isodiametric to short-oblong alveoli, not transversely ridged; bristles 6, surpassing the tubercle; tubercle usually deltoid-subulate, setose, especially on the margin. (*R. prolifera* Small)

Wet woodlands, cypress-gum swamps, marshy shores. Coastal plain, N.C. to n. cen. Fla., w. to Tex.

16. Cladium

Cladium jamaicense Crantz. SAW-GRASS. Fig. 238

Leafy-stemmed perennial, with large stolons about 1 cm in diameter sheathed by scalelike leaves 1.5–2 cm long. Stem obtusely 3-angled, 1–3 m tall. Leaves flat, 3–9 cm long, 0.5–1.5 cm wide, midrib stiff spinulose-serrulate below, the margins cartilaginous

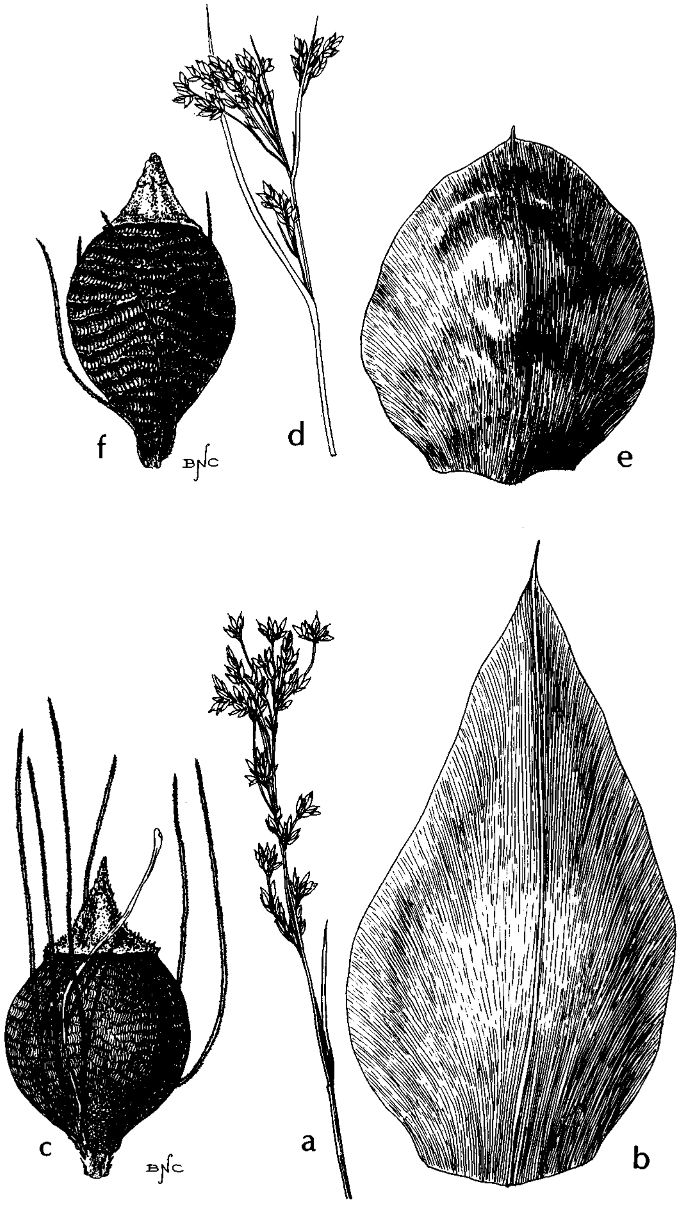

Fig. 236. a–c, **Rhynchospora odorata:** a, portion of inflorescence; b, scale; c, achene; d–f, **Rhynchospora decurrens:** d, portion of inflorescence; e, scale; f, achene.

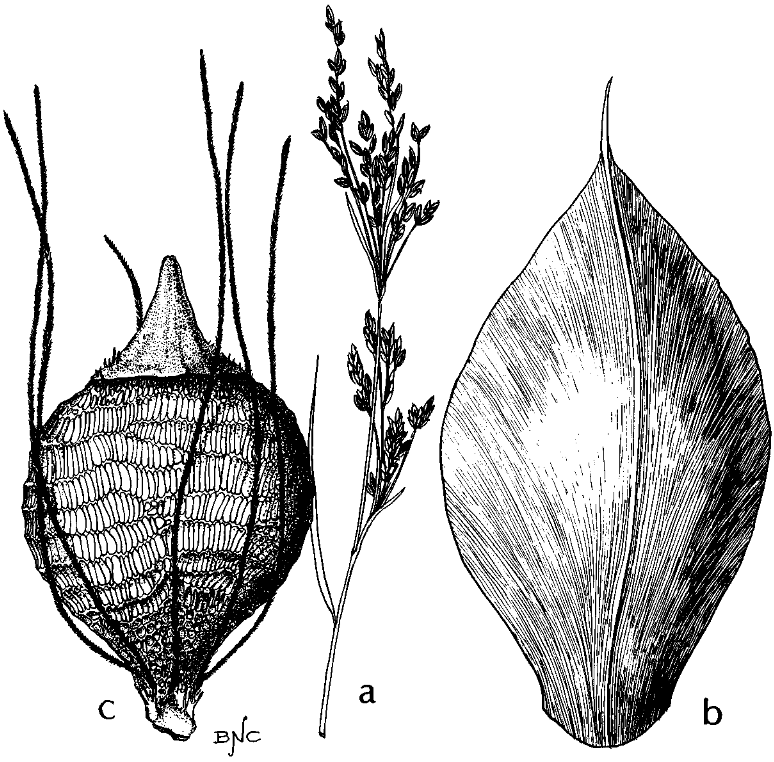

Fig. 237. **Rhynchospora caduca:** a, portion of inflorescence; b, scale; c, achene.

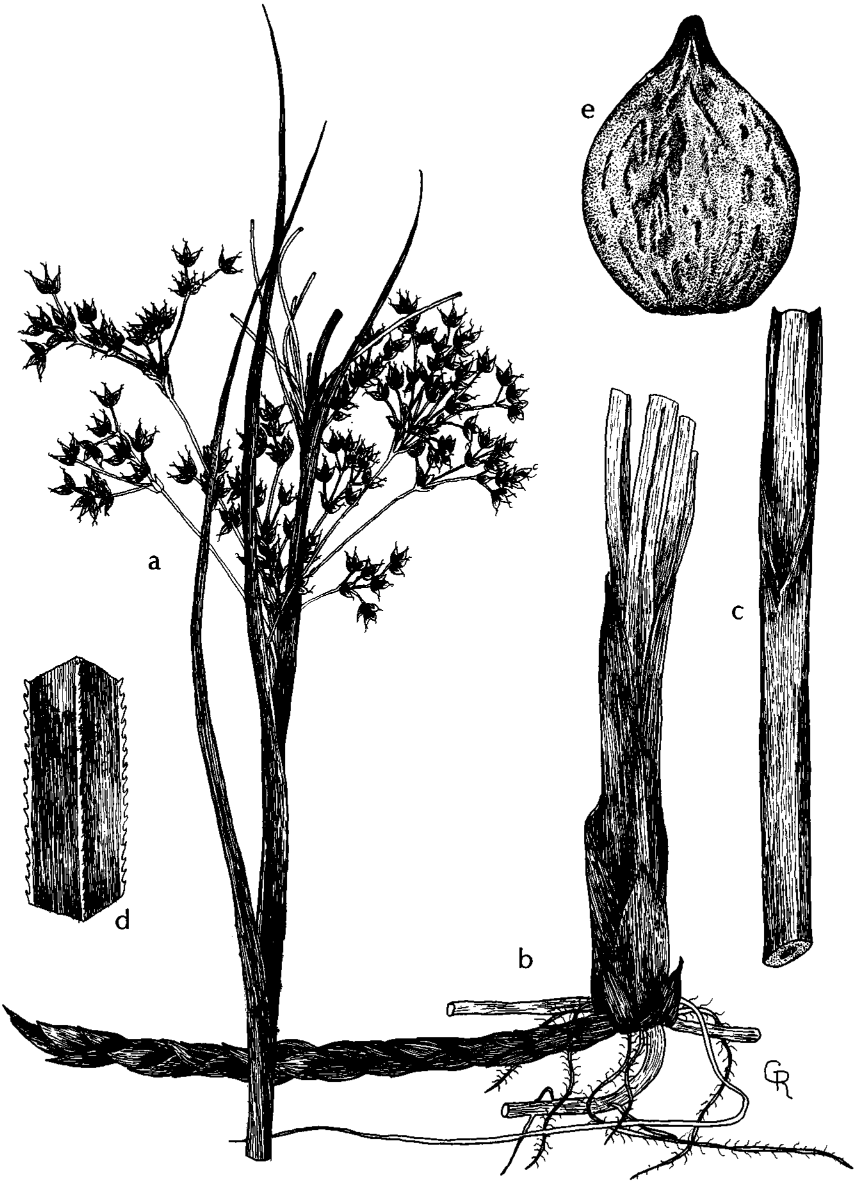

Fig. 238. **Cladium jamaicense:** a, inflorescence; b, base of plant; c, small portion of stem; d, small section of leaf; e, achene.

and spinulose-serrulate, i.e., saw-toothed. Inflorescence elongate, leafy-bracted below, the divisions cymose, the lower on flexuous stalks. Spikelets 2–6 at the ends of the branches, 1-flowered, each with a single fertile floret and below it 2–3 spirally imbricate scales, all but the lowest enclosing stamens, the largest chestnut-colored scales 3.5 mm long, acute or with a minute mucro. Perianth absent. Achene ovoid-spherical, not at all compressed, 2–2.5 mm long, wrinkled on the surface, apiculate or obtuse at apex, narrowed at base. Bristles none. (*Mariscus jamaicensis* (Crantz) Britt.)

Swamps, marshes and shores, near the coast, the principal plant of the Everglades marshes of Fla., Va. to Fla. and Tex.; W.I.

17. Remirea

Remirea maritima Aubl. BEACH STAR.

Perennial by slender, elongate, horizontal stolons. Stem 0.5–3 dm tall, solitary or in clumps, leafy to the summit, leaf sheaths inflated, over-lapping, completely covering the stem. Leaves 2–8 cm long, 2–7 mm wide, triquetrous, apex slightly thickened, spinulose-tipped, suberect, curving outward and somewhat downward. Bracts of the inflorescence 2–6, like the leaves. Spikes ovoid, dense, solitary to many, sessile, 1–2 cm long, 6–10 mm wide at base, subtended by a bracteate involucre. Spikelets numerous, spirally arranged, about 4 mm long, 1-flowered. Scales of the spikelet 3–4 mm long, shortest at base of spikelet and gradually elongating upward, lowermost scales empty, uppermost enclosing flower and achene, ovate, all thin except the uppermost, brown. Achene 2–3 mm long, about 0.7 mm wide, 3-angled, curved, apiculate, surface granular, completely enclosed by the uppermost, corky scale.

Sandy ocean beaches, east coast of Florida and the Keys; W.I.; Old World.

18. Schoenus

Schoenus nigricans L. BLACK SEDGE. Fig. 239

Perennial, forming large dense clumps. Leaf sheaths dark reddish brown to almost black, the blades stiff, long, triangular-channelled, striate, the edges scabrous. Stems to about 7 dm tall, subrectangular, smooth, terminated by an involucrate, capitate cluster of dark reddish brown sessile spikelets. Lowermost bract with a broad, coriaceous sheathlike base and a stiff ascending pointed blade 1–8 cm long. Scales of spikelet overlapping in 2 series, sharply keeled, acute, the lower often empty. Flowers bisexual, with 3–6 short, stiff, scabrous perianth bristles. Stamens 3. Ovary sessile or short-stipitate, the style long, about 6 mm, terminated by 3 subulate stigmas. Achene trigonous to nearly terete, white, the angles not sharp, oval, usually somewhat constricted at both ends, about 1.5 mm long, without a tubercle (but jointed abruptly with the differently textured very long style) and shedding without the bristles, these remaining on the axis.

In our range, sporadic in marshes, wet calcareous pinelands and prairies; also about hot springs and other wet places of semiarid regions. Fla. to Tex.; Calif.; warm temp. semiarid regions of the world.

19. Scleria (NUT-RUSHES)

Perennial rhizomatous herbs or annuals with fibrous roots. Stems sharply 3-angled. Lowest leaf sheaths bladeless, the upper with keeled blades. Flowers unisexual, staminate and pistillate spikelets usually mixed in a given cluster. Perianth none. Achene usually stony, bony, or enamellike in texture; without a tubercle at its summit.

1. Base of the achene a circular, angular or lobed disk which often bears tubercles.
  2. Achene body smooth; disk granular or papillose-crusty.
    3. Disk obscurely 3-angled, granular or papillose-crusty, without tubercles, base narrowed below disk. 1. *S. triglomerata*

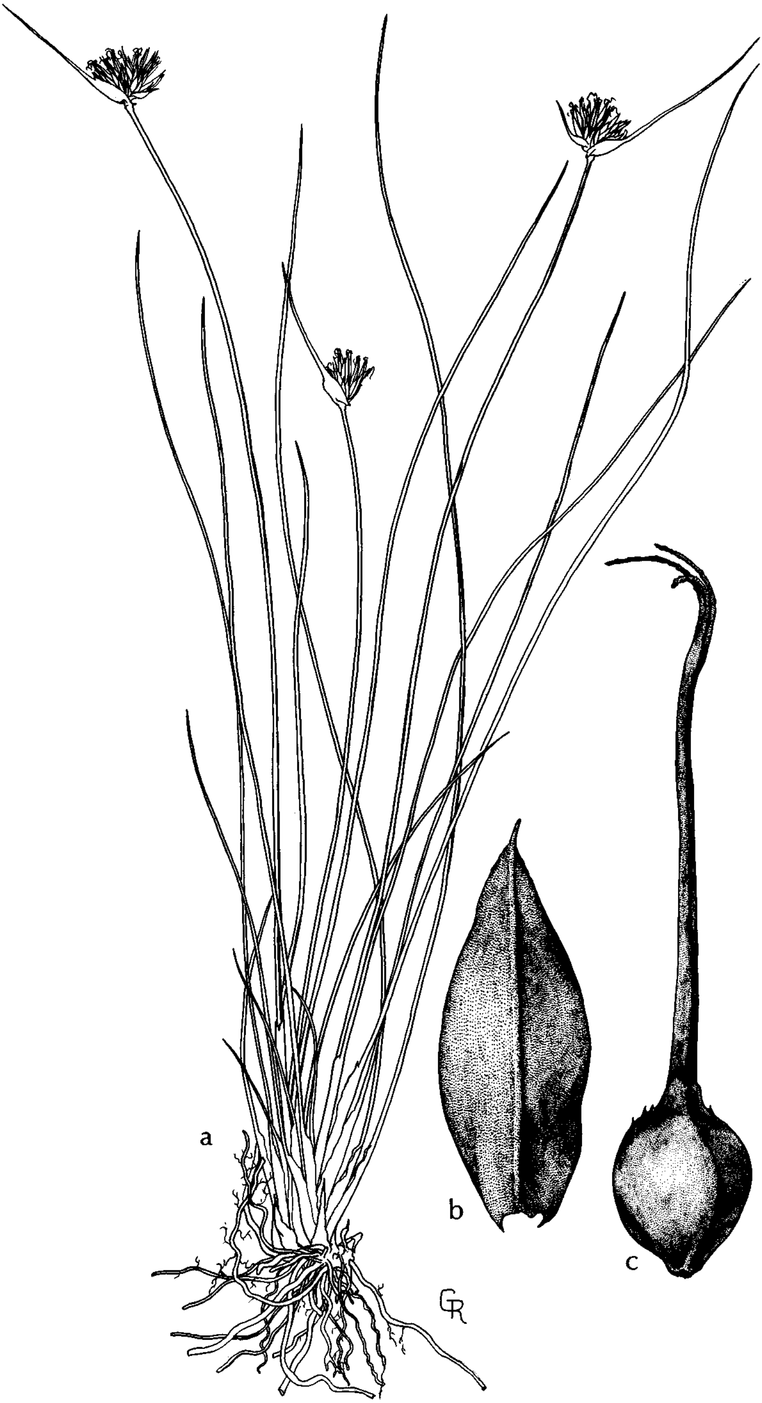

Fig. 239. **Schoenus nigricans:** a, habit; b, scale; c, achene.

3. Disk with 8–9 granular or papillose-crusty tubercles and with a flaring rim below it. 2. *S. oligantha*

2. Achene body reticulate, warty, or papillose.

4. Body of the achene reticulate (rarely vaguely warty); disk 3-lobed, the lobes bractlike and appressed to the lower portion of the body. 3. *S. reticularis*

4. Body of the achene tuberculate or papillose; disk with tubercles.

5. Achene 2–3 mm long; disk with 3 tubercles, these sometimes 2-notched or -lobed. 4. *S. ciliata*

5. Achene 1.5–2 mm long; disk with 3 pairs of tubercles. 5. *S. pauciflora*

1. Base of the achene without disk or tubercles, but variously narrowed-angular.

6. Inflorescence a single terminal cluster; achene body with vertical ridges and an obpyramidal base.

7. Achene constricted below to a triangular base and with a pair of iridescent pits on each of the sides of the triangular base. 6. *S. georgiana*

7. Achene lacking pits in the concavities of the sides of the triangular base. 7. *S. baldwinii*

6. Inflorescence of separated sessile clusters along a long axis or of 1–4 interrupted distant simple or branched spikes.

8. Leaves, bracts and scales of the inflorescence with long hairs. 8. *S. hirtella*

8. Leaves, bracts and scales of the inflorescence glabrous.

9. Body of the achene smooth. 9. *S. lithosperma*

9. Body of the achene irregularly verrucose with short low transverse ridges. 10. *S. verticillata*

1. **Scleria triglomerata** Michx. TALL NUT-RUSH. Fig. 240

Coarse perennial with thick knotty rhizomes, often in large clumps, the stems to 1 m tall, glabrous to somewhat pubescent. Leaf blades flat, to 9 mm broad, the margins finely scabrous. Spikelets in terminal, single, or interrupted fascicles and usually with 1–2 long-stalked fascicles below. Achene subglobose to oblong or ovate, mostly 2.5–3.5 mm long, the body smooth lustrous white, subtended by an obscurely 3-angled finely granular or papillose-crusty disk, the extreme base narrowed below the disk.

On wet to dry sites, bogs, savannas, pinelands, thickets and open woods. Mass. to Ont. and Wis., generally southward to Fla. and Tex.

Various authors distinguish, as *S. minor* Stone, plants generally similar to the above but with more slender stems and leaves and somewhat smaller achenes.

2. **Scleria oligantha** Michx. Fig. 240

Perennial with knotty rhizomes, the stems to 6 dm tall, glabrous or pubescent, sometimes glaucous. Leaf blades flat, 3–6 mm wide, the margins and midribs below glabrous, scabrous, or ciliate. Spikelets in 1–2 terminal fascicles and in lateral fascicles on long flexuous stalks. Achenes mostly 3–4 mm long, ovate, the body smooth and lustrous white, subtended by a low obscurely triangular disk bearing 8–9 finely granular or papillose-crusty tubercles, the extreme base a flaring rim.

Commonly in rich or mixed well-drained upland woods, also in floodplain woodlands, on stream banks and in meadows. Va. to Mo., s. to Fla., e. Tex.; e. Mex.

3. **Scleria reticularis** Michx. Fig. 241

Annual with soft bases and fibrous roots or perennial with very short relatively soft rhizomes, commonly with a great many stems, these weak and reclining, the stems to 7 dm tall. Leaf blades 2–5 mm wide, flat, glabrous or sparsely hirsute, the margins and midribs below often scabrous, usually shorter than the flowering stems. Spikelets in open terminal and axillary panicles, the latter remote on short, erect stalks, or sessile, or on long pendulous stalks. Achene body subglobose or globose-elliptic, dull white, grayish, or diry white, the surface reticulate or reticulate and with short horizontal ridges, uniformly pubescent, pubescent in patches, or glabrous (rarely); achene body subtended by a short stalklike portion bearing three bractlike structures which closely appress the base of the achene body. (*S. muhlenbergii* Steud.; *S. setacea* Poir.)

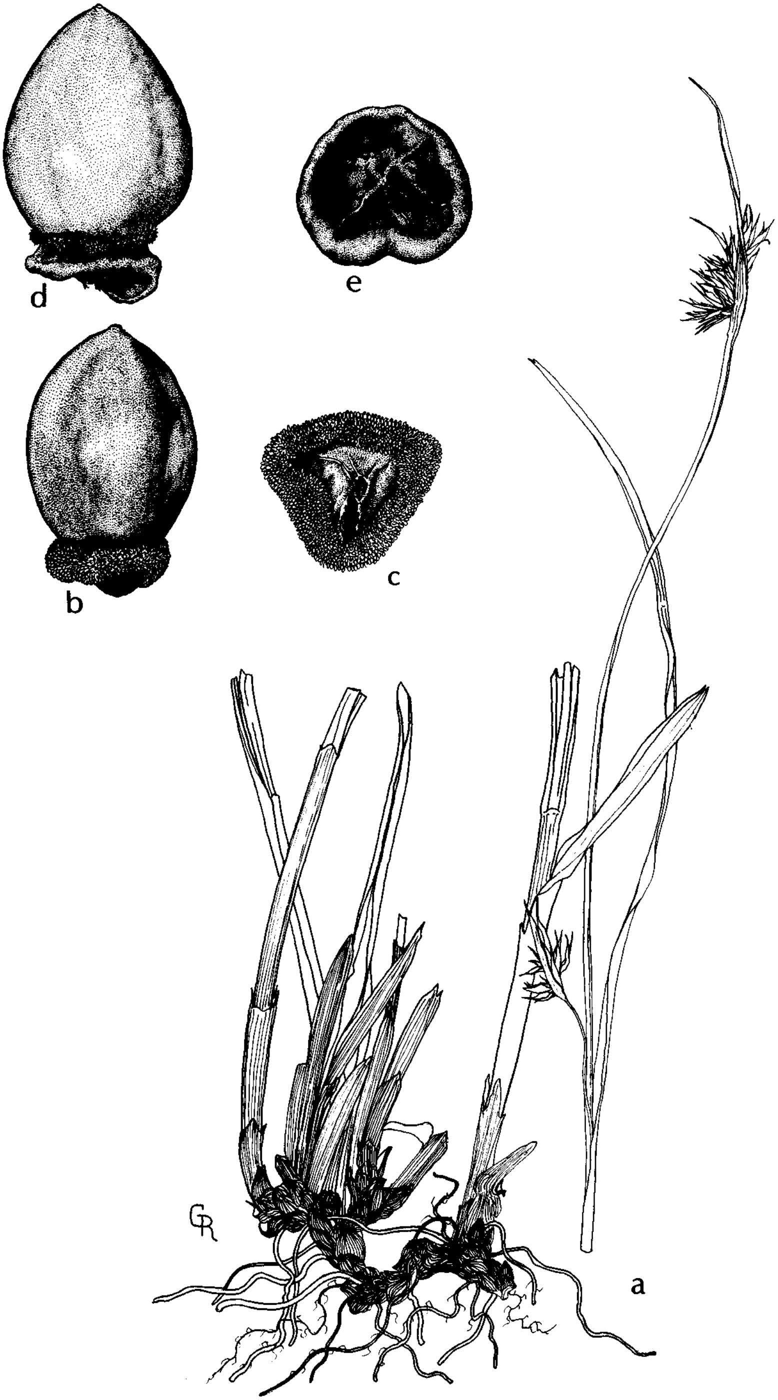

Fig. 240. a–c, **Scleria triglomerata:** a, habit; b, achene, lateral view; c, achene, basal view; d–e, **Scleria oligantha:** d, achene, lateral view; e, achene, basal view.

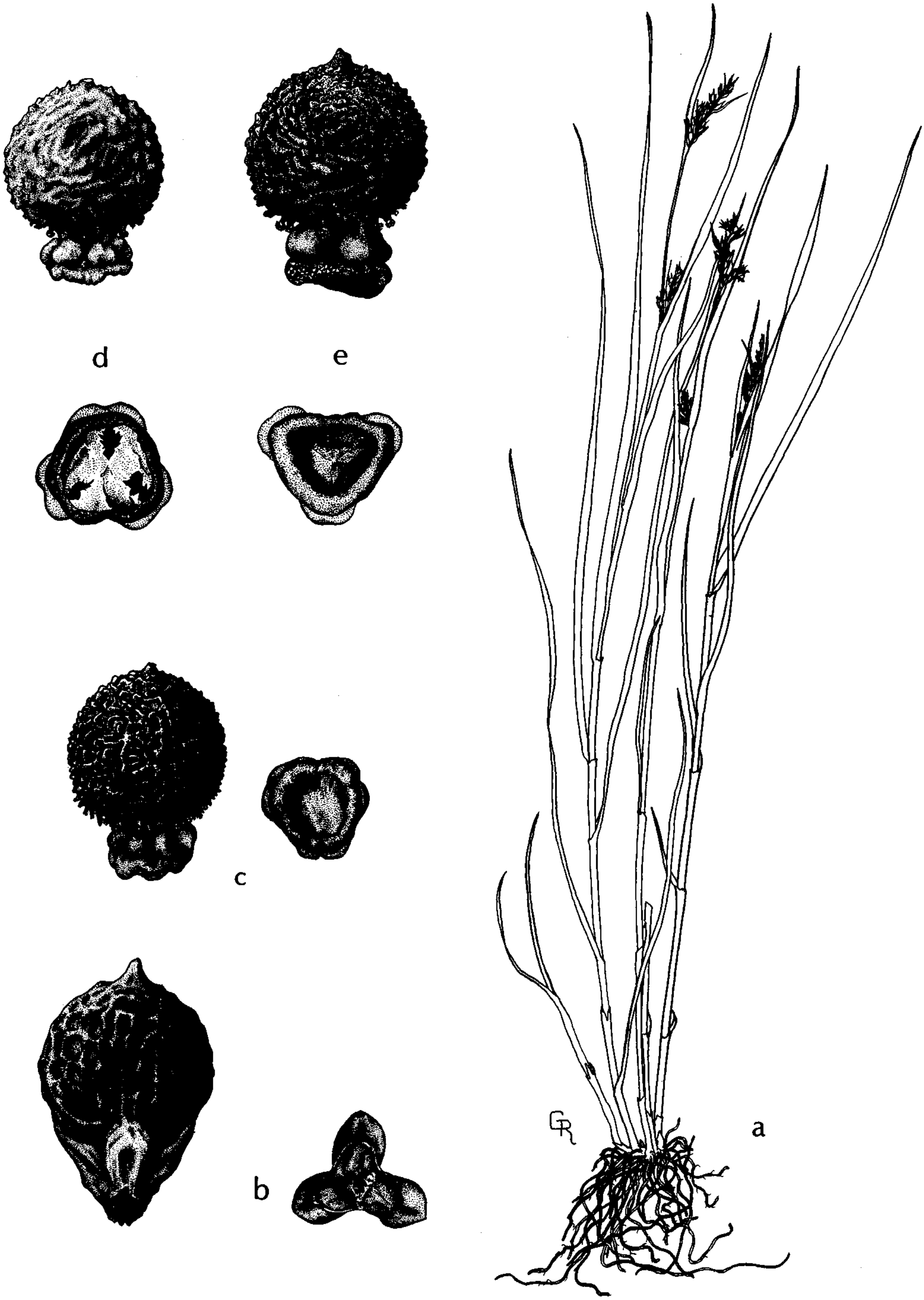

Fig. 241. a–b, **Scleria reticularis:** a, habit; b, achene, lateral and basal views; c–e, **Scleria ciliata:** three achenes, lateral and basal views, to show variation.

Wet open sands, peaty-sands, often in shallow water of cypress ponds, bogs, meadows, wet pinelands and savannas. Mass. and N.Y. to Fla. and Tex.; also in Ind. and Mo.; trop. Am.

4. Scleria ciliata Michx. Fig. 241

Perennial with thickish knotty rhizome, the flowering stems to about 7 dm tall, varying from relatively stout to relatively slender, glabrous, or more commonly pubescent, especially on the angles. Leaves variable in width, from 1–7 mm, keeled, glabrous to pubescent. Spikelet clusters terminal or both terminal and axillary, stalks of the latter short to long-filiform. Achene 2–3 mm long, the body globose or ovoid, white-lustrous, its surface papillose to irregularly verrucose, sometimes with basal papillae elongate-deflexed; achene body subtended by 3 finely granular tubercles, these often 2-lobed, then a narrow disk below. (*S. brittonii* Core; *S. elliottii* Chapm.)

Commonly in longleaf pine–scrub oak on sand ridges where soils are relatively dry; often in moist areas of pine flatwoods or savannas, cypress pond margins, hillside bogs. S.e. Va. to Fla. and Tex.

5. Scleria pauciflora Muhl. ex Willd.

General features as in *S. ciliata.* Achenes similar but averaging smaller, mostly 1.5–2 mm long, the body of the achene subtended by 3 pairs of tubercles.

Pine flatwoods and savannas, boggy seepage slopes, swamps, meadows and prairies. N.H. to Ohio, Mo., Kans., s. to Fla. and Tex.; W.I.

There is, in the literature, a considerable diversity of interpretation in delimiting and naming taxa, both specific and infraspecific, in both *S. pauciflora* and *S. ciliata,* especially the latter.

6. Scleria georgiana Core. Fig. 242

Perennial with knotty short rhizomes and commonly forming large tufts, the stems slender, sometimes filiform, glabrous, to 5 dm tall. Leaf blades involute, glabrous, 1–2 mm wide. Spikelet clusters terminal. Achenes 2–3 mm long, the body globose-elliptic, longitudinally ridged at least below; sharply constricted at base to form 3 short postlike structures marking the points of three angles, the surfaces between the posts concave and each has a pair of yellow iridescent pits; below this is a very short obpyramidal base.

Moist to wet sands and sandy peats of pine flatwoods, savannas, cypress and gum pond margins. Coastal plain, N.C. to Fla. and s.e. Tex.; W.I.

7. Scleria baldwinii (Torr.) Steud. Fig. 242

Similar to *S. georgiana* but with thicker and more spreading and knotty rhizomes, the flowering stems stouter and taller, to 9 dm tall. Leaf blades 1–5 mm wide, smooth or scabrous on the margins. Spikelets in terminal clusters. Achene very similar to the preceding but averaging larger, 3–4 mm long, and the concavities at the base lacking yellow iridescent pits.

Wet sands or sandy peats, often in shallow water, wet pinelands and savannas, borders of ponds, drainage ditches, borrow-pits. Coastal plain, S.C. to Fla. and s.e. Tex.

8. Scleria hirtella Sw. Fig. 243

Perennial with slender aromatic rhizomes and commonly forming colonies, the stems to 6 dm tall, slender. Sheaths and leaf blades pubescent, the blades 2–5 mm wide. Spikelets in small rounded clusters, often nodding, alternating around a long axis; bracts and scales conspicuously long-ciliate. Achene 1–1.5 mm long, the body smooth, white and shiny, obovoid, narrowed abruptly to a 3-angled base.

Moist to wet sands and sandy peats of savannas, pine flatwoods, commonly in boggy grassy areas of highway, railway, and power-line rights of way. Coastal plain, Ga. and Fla. to s.e. Tex.; trop Am.

9. Scleria lithosperma (L.) Sw. Fig. 243

Perennial with short rhizomes, the flowering stems to 6 dm tall, often filiform. Leaves

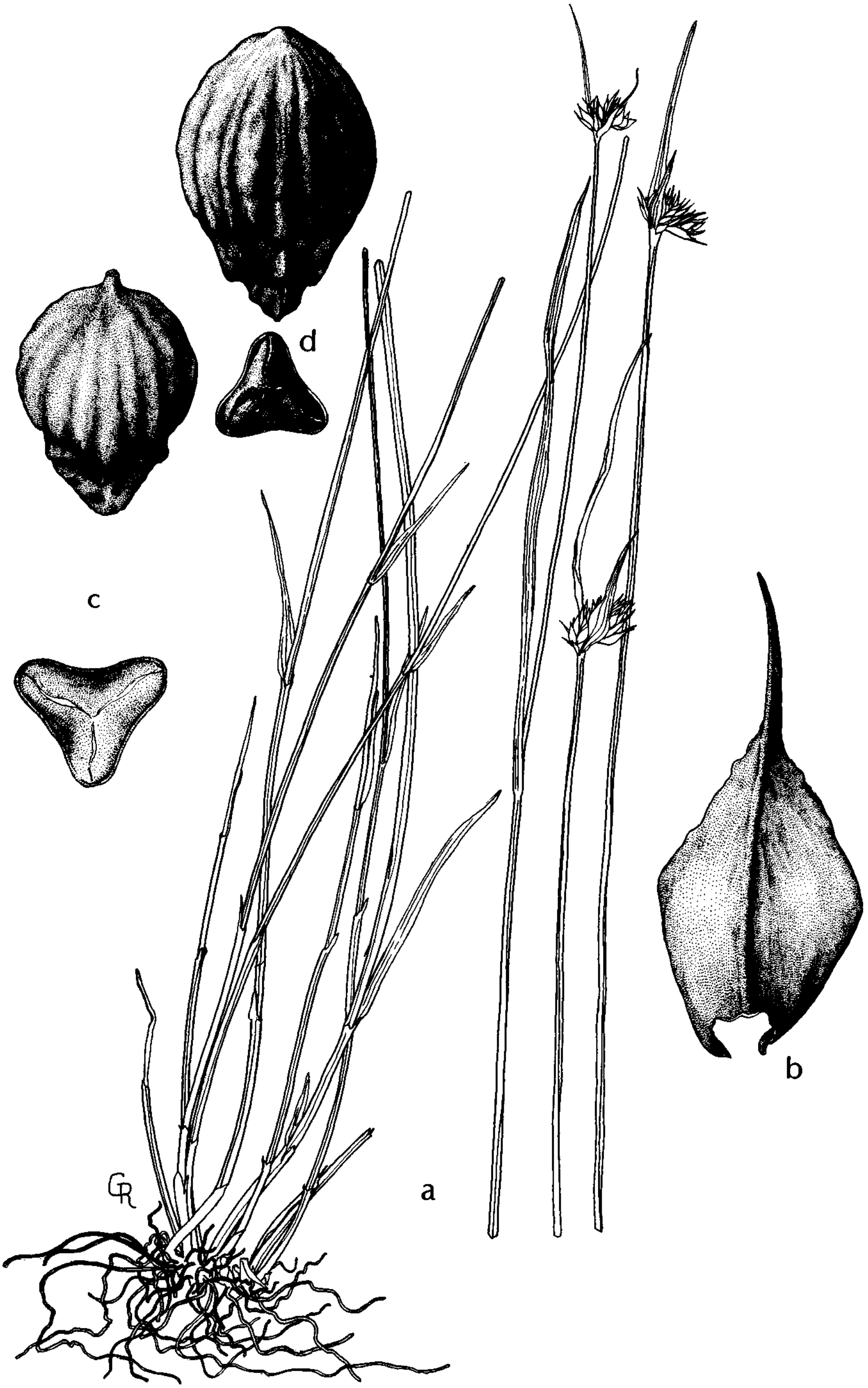

Fig. 242. a–c, **Scleria baldwinii:** a, habit; b, scale; c, achene, lateral and basal views; d, **Scleria georgiana:** achene, lateral and basal views.

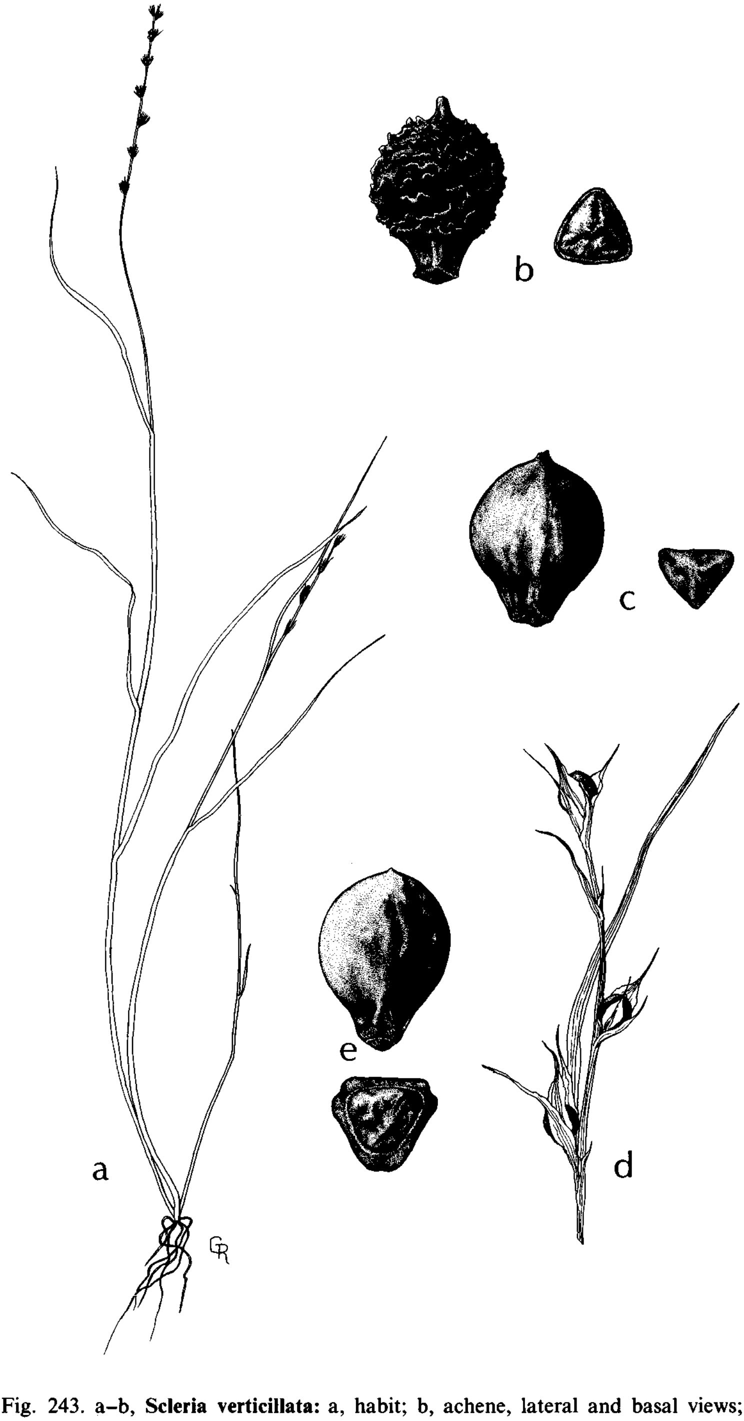

Fig. 243. a–b, **Scleria verticillata:** a, habit; b, achene, lateral and basal views; c, **Scleria hirtella:** achene, lateral and basal views; d–e, **Scleria lithosperma:** d, inflorescence branch or tip; e, achene, lateral and basal views.

1–3 mm wide, glabrous or slightly scabrous, involute. Spikelets in 2–4 terminal interrupted clusters and in long-stalked axillary panicles. Achenes 2–2.5 mm long, the body white, smooth and shining, subglobose; narrowed abruptly below to form 3 short postlike portions marking the 3-angled base, the faces between the angles concave, a brown rim at the extreme base.

Pinelands and hammocks, on limerock, where alternately wet and dry. Everglade Keys, Fla. and Fla. Keys.; Old and New World tropics.

10. Scleria verticillata Muhl. ex Willd. Fig. 243

Annual with soft bases and fibrous aromatic roots, often tufted, the stems slender, often filiform, glabrous. Spikelets in sessile, roundish, remote clusters alternating around a long axis. Achene 1–1.5 mm long, the body globose, whitish, reticulate-papillose or -verrucose, abruptly narrowed below to 3 tiny postlike portions marking the angles, 3 flattish faces between, a very thin flat disk at the extreme base.

Wet sands, sandy peats and marls, sometimes in shallow water, pinelands and savannas, cypress and gum ponds and depressions, marl prairies. Mass. to s. Ont. and Minn., generally southward to s. Fla. and e. Tex.; trop. Am.

20. Carex (SEDGE)

Perennial herbs, with grasslike solid stems, 3-ranked leaves with sheathing bases. Flowers unisexual, each in the axil of a scale, borne in spikes. Perianth none. Staminate and pistillate flowers in separate spikes, or in different parts of the same spike, if in the same spike the staminate flowers at the top of the spike, the pistillate below, or in the reverse order. Staminate flowers of 3 stamens only (rarely 2), pistillate of one pistil enclosed by a saclike structure (not adhering to it), the perigynium, the latter usually narrowed to a beak through the terminal orifice of which the stigma protrudes at anthesis; perigynium together with enclosed achenial fruit falls entire at maturity. Stigmas 2, achene lenticular (biconvex) or stigmas 3, achene 3-angled.

A very large "technical" genus. Identification, especially for the nonexpert, requires that specimens will have been obtained giving careful attention to extraction of the underground parts from the substrate and assuring that some at least of the spikes with their perigynia and achenes were fully mature.

Many Carices inhabit mesic to moist to wet situations. We had, therefore, to exercise a certain degree of arbitrariness in selection of those taxa to include for wetlands.

1. Achene lenticular (biconvex), stigmas 2.
  2. Spikes all short, not exceeding 2–3 times as long as broad.
    3. Some or all the spikes with staminate flowers above, pistillate below.
      4. Body of perigynium corky-thickened at the base, this more evident internally by a mass of spongy-corky tissue upon or in which the achene is seated.
        5. Perigynium narrowly stipitate at the very base then abruptly expanded into a nearly circular, thickish, disklike portion, distally abruptly narrowed to a conical portion of the body. 1. *C. crus-corvi*
        5. Perigynium not expanded into a nearly circular, thickish, disklike base but broadest at the base then narrowed gradually distally.
          6. Upper portions of leaf sheaths loose, their ventral surfaces whitish-papery and usually horizontally rugose. 2. *C. stipata*
          6. Upper portions of leaf sheaths closely surrounding the stem, their ventral surfaces chartaceous-stramineous, smooth, not rugose. 3. *C. laevivaginata*
      4. Perigynia not corky-thickened at base within.
        7. Body of perigynium biconvex, brown at maturity. 4. *C. decomposita*
        7. Body of perigynium plano-convex, greenish to straw-colored at maturity.
          8. Inflorescences usually 5 times as long as broad or more; achenes 1.0–1.2 mm long. 5. *C. vulpinoidea*
          8. Inflorescences 2–4 times as long as broad; achene about 1.8 mm long. 6. *C. fissa* var. *aristata*

3. Some or all the spikes with staminate flowers below, pistillate above.

9. Perigynia lanceolate, not wing-margined, body with spongy tissue within at base, achene seated above that; spikes linear, much longer than broad. 7. *C. bromoides*

9. Perigynia ovate, suborbicular, obovate, or reniform, or if lanceolate then with narrow thin wing-margins and spikes little if any longer than broad.

10. Perigynia diverging at right angles from the axis or reflexed, not wing-margined, at most with thin edges; base of perigynium within with spongy tissue, achene seated above that and occupying scarcely any of the lower portion.

11. Beak of perigynium smooth, without teeth. 8. *C. seorsa*

11. Beak of perigynium toothed.

12. Leaf blades 2–4 mm wide; body of perigynium broader than long. 9. *C. atlantica*

12. Leaf blades mostly not exceeding 1.0 mm wide, rarely to 1.5 mm wide; body of perigynium longer than broad. 10. *C. howei*

10. Perigynia wing-margined, strongly ascending and overlapping in the spike.

13. Perigynia lanceolate, at least 2½ times as long as broad.

14. Wing of perigynium abruptly narrowed below the middle, scarcely if at all winged at base; achene substipitate at base. 11. *C. tribuloides*

14. Wing of perigynium somewhat narrowed below the middle but winged to the base; achene long-stipitate at base. 12. *C. scoparia*

13. Perigynia ovate, suborbicular, broadly elliptic, obovate, or reniform, not exceeding 2 times as long as broad, sometimes broader than long.

15. Achene occupying approximately ½ of the perigynium in the lateral dimension.

16. Perigynium abruptly narrowed distally into a short-triangular beak. 13. *C. festucacea*

16. Perigynium gradually narrowed distally into an elongate-triangular or subulate beak. 14. *C. normalis*

15. Achene occupying ⅓ or less than ⅓ of perigynium in the lateral dimension.

17. Pistillate scales acute, acuminate, or obtuse.

18. The pistillate scales approximately as long as the perigynia, acute to acuminate; achene ovate in outline, 1.5–2.0 mm long. 15. *C. albolutescens*

18. The pistillate scales ½ as long as perigynia, scarcely more, mostly obtuse, sometimes acute; achenes elliptic-oblong in outline, about 3 mm long. 16. *C. reniformis*

17. Pistillate scales short-aristate. 17. *C. alata*

2. Spikes elongate-cylindric, many times longer than broad.

19. Pistillate scales as long as or longer than the perigynia, the green median extending well beyond the body as a rough, subulate awn and giving the spike a bristly appearance; sides of the scale pale to light rusty brown. 18. *C. crinita*

19. Pistillate scales shorter than to as long as the perigynia, the green median ending just below the tip, apically obtuse to acute but not at all awned, the spike not at all bristly; sides of the scale rich chestnut brown to purplish brown. 19. *C. stricta*

1. Achenes 3-angled, stigmas 3.

20. Spike solitary and terminating the stem, wholly pistillate, *or* pistillate below, staminate above, *or* staminate below and pistillate above.

21. Spikes linear to lanceolate, few-flowered, sometimes with staminate terminal portions. 20. *C. leptalea*

21. Spikes broadly oblong, ovate, or subglobose, 10–40 mm long, 10–20 mm broad, with a narrowly turbinate, staminate basal portion.

22. Pistillate scales apically acuminate or short-awned; style persistent, strongly bent below the middle. 42. *C. squarrosa*

22. Pistillate scales apically acute or obtuse; style persistent, straight. 43. *C. typhina*

20. Spikes 2 or more.

23. Terminal spike pistillate above, staminate below.

24. Spikes short-cylindric to short-ovate, to 15 mm long or a little more, sessile, stiffly erect-ascending.

25. Perigynia appressed-ascending on the axis, in cross-section flat on one side. 21. *C. complanata*

25. Perigynia disposed from the axis approximately at right angles, in cross-section (when fresh at least) nearly circular in outline. 22. *C. caroliniana*

24. Spikes narrowly elongate-cylindric, 20–40 mm long, 3–4 mm wide, flexuous, the lower at least on slender, flexuous stalks, somewhat nodding. 23. *C. oxylepis*

23. Terminal spike(s) staminate throughout, or sometimes with some pistillate flowers basally.

26. Plant with tough, coarse rhizomes about 1 cm in diameter, usually abundantly clothed with persistent old, usually fibrous, leaf bases. 24. *C. cherokeensis*

26. Plant without rhizomes or if rhizomatous then the rhizomes not nearly 1 cm in diameter.

27. Perigynia beakless.

28. Nerves on the perigynia sometimes all impressed, sometimes a few raised and the intervening ones impressed (impressed nerves do not show strongly, often the internerve tissue is raised sufficiently and is so narrow as to appear like a nerve). 25. *C. amphibola*

28. Nerves on the perigynia all raised, bony-cartilaginous in texture and sharply contrasting with the tissue between. 26. *C. flaccosperma*

27. Perigynia with short to long beaks.

29. Style jointed near the base, withering and disarticulating at the joint, mature achene at most with an apiculation at the summit.

30. Perigynia pubescent.

31. Pistillate spike usually solitary, sometimes 2, stiffly erect, sessile or nearly so, compactly flowered; plant with slender, elongate rhizomes, usually forming extensive almost pure stands. 32. *C. walteriana*

31. Pistillate spikes 3–4 or more, the lower slenderly long-stalked, flexuous, arching or drooping, loosely flowered; plant densely cespitose.

32. Perigynium lanceolate, lance-elliptic, or narrowly ovate, distally tapering gradually into a short, not very distinct beak.

33. Perigynia strongly 2-ribbed, obscurely and usually unevenly nerved between the ribs; pistillate scales whitish hyaline on the sides. 27. *C. debilis*

33. Perigynia conspicuously evenly nerved from base to apex; sides of pistillate scales more or less suffused with brown. 28. *C. venusta*

32. Perigynium obovate in outline, 3-angled, abruptly narrowed into a distinct beak about 2 mm long. 29. *C. scabrata*

30. Perigynia glabrous.

34. Pistillate spikes loosely flowered, flexuous and arching or drooping, many times longer than broad.

35. Perigynia 2-ribbed, obscurely and unevenly nerved between the ribs; pistillate scales with green median extended beyond the hyaline sides as a toothed mucronate or aristate tip. 27. *C. debilis*

35. Perigynia 2-ribbed, completely nerveless between the ribs; pistillate scales obtuse to acute apically. 30. *C. prasina*

34. Pistillate spikes compactly flowered, the spike itself not flexuous and arching or drooping (though its stalk may be slender, flexuous and arching or drooping), or if spikes loosely flowered then spikes not over 2 times as long as broad.

36. The pistillate spike usually solitary, sometimes 2, sessile, erect.

37. Plant cespitose; perigynia disposed at right angles from the axis or nearly so; pistillate spikes from broader than long to not over 2 times as long as broad, mostly from 15–20 mm broad; base of stem green to stramineous. 31. *C. turgescens*

37. Plant with elongate rhizomes, usually forming extensive almost pure stands; perigynia strongly ascending on the axis; pistillate spikes usually 3 or more times as long as broad, usually not exceeding 8 mm broad; base of stem reddish-purple. 32. *C. walteriana*

36. The pistillate spikes 3–6.

38. Plant with soft, weak leaves, relatively very slender stems, mostly 1–6 (–8) dm tall; perigynia pale green, olive green, to brownish.

39. Plant cespitose, with several stems from a crown; staminate spike sessile or short-stalked. 33. *C. granularis*

39. Plant rhizomatous, with a solitary stem from a given place on the rhizome; staminate spike long-stalked.

40. Beak of perigynium short-bidentate at the orifice. 34. *C. microdonta*

40. Beak of perigynium entire at the orifice. 35. *C. crawei*

38. Plant with stiff, rigid leaves, relatively coarse stems, mostly 8–10 (–12) dm tall; perigynia strongly glaucous (in age often becoming rusty brown).

41. Body of pistillate scale retuse, emarginate, or rounded at the summit, an aristate tip definitely differentiated from the summit of the body; perigynia 2-

ribbed, between the ribs smooth or faintly and irregularly nerved on the upper portions.

42. Lowest pistillate spike on a slender, flexuous, drooping stalk. 36. *C. glaucescens*

42. Lowest pistillate spike sessile or short- stiff-stalked and erect. 37. *C. verrucosa*

41. Body of pistillate scales tapering distally into an acuminate to aristate tip; perigynia 2-ribbed, distinctly and evenly nerved between the ribs, usually from the base into the beak, sometimes weakly nerved in the lower half. 38. *C. joorii*

29. Style not jointed near the base, hard and persistent, remaining attached to the mature achene.

43. Perigynia lanceolate to narrowly lance-ovate.

44. Pistillate spikes loosely few-flowered; beak of perigynium with 2 short, erect teeth at the orifice, the overall appearance of the spike not finely bristly. 39. *C. folliculata*

44. Pistillate spikes compactly very many flowered; beak of the perigynium with 2 long-subulate, widely diverging teeth giving the spike a finely bristly appearance. 40. *C. comosa*

43. Perigynia not lanceolate, broader, ovate to obovate.

45. Body of perigynium obconic-obovate, inflated at the summit and abruptly narrowed into the beak.

46. Pistillate scales with subulate tips 2–3 mm long or a little more, considerably exserted from between or even beyond the perigynia; pistillate spikes about 10 mm wide. 41. *C. frankii*

46. Pistillate scales obtuse, acute, or with short-subulate tips, not exserted from between the perigynia; pistillate spikes 15–20 mm wide.

47. Apices of pistillate scales acuminate or short-aristate; beak of perigynium 3 mm long; style strongly bent below the middle. 42. *C. squarrosa*

47. Apices of pistillate scales short-acute or obtuse; beak of perigynium 2 mm long; style straight. 43. *C. typhina*

45. Body of perigynium gradually tapering or rounded at the summit.

48. Surface of perigynium dull, olivaceous to brown at maturity, weakly nerved, especially toward the summit, or not at all nerved toward the summit. 44. *C. hyalinolepsis*

48. Surface of perigynium somewhat shiny, green to stramineous at maturity, strongly raised-nerved at least on the upper half.

49. Pistillate scales with a scabrid, long-subulate or aristate tip longer than, usually considerably longer than, the body of the scale. 45. *C. lurida*

49. Pistillate scales acute to acuminate or short-aristate, if aristate then awn not as long as the body of the scale.

50. Overall length of perigynia 9 mm or less.

51. Pistillate spikes to 1 cm long, sometimes 1.5 cm long, as broad as long or nearly so, few-flowered; perigynia diverging from the axis at wide angles or even at right angles. 46. *C. elliottii*

51. Pistillate spikes mostly 2–3 cm long, mostly distinctly longer than broad; perigynia compactly and strongly ascending, usually more than 20 per spike. 47. *C. bullata*

50. Overall length of perigynia 10 mm or more.

52. Pistillate spikes subglobose, perigynia radiating from the axis in all directions.

53. Perigynia ovate in outline, the base rounded below the widest portion, glabrous. 48. *C. intumescens*

53. Perigynia broadest above the middle, tapering from the broadest portion to the base, pubescent over the entire surface or at least on the tapering base. 49. *C. grayii*

52. Pistillate spikes longer than broad, or if as broad as long then the perigynia appressed-ascending.

54. (3 choices) Plant with horizontal, elongate rhizomes, stems arising singly or in small tufts from the rhizome, spreading-clonal; pistillate spikes from somewhat longer than broad to as broad as long, perigynia appressed-ascending; achene about as broad as long. 50. *C. louisianica*

54. Plant with short, arching-ascending offshoots and strongly clump-forming; pistillate spikes considerably longer than broad with rare exception; perigynia appressed-ascending, somewhat tapering basally; achene ⅔ as wide as long to nearly as wide as long. 51. *C. lupulina*

54. Plant not rhizomatous and strongly clump-forming or with elongate, arched-ascending rhizomes and loosely cespitose; spikes longer than broad; perigynia diverging from the axis approximately at right angles, essentially truncate basally; achene conspicuously wider than long. 52. *C. gigantea*

1. Carex crus-corvi Shuttlw. ex Kuntze. Fig. 244

Cespitose. Stems relatively stout, surpassed by the leaves. Principal leaf blades 5–10 mm wide, sheaths loose, ventrally papery on the distal portions, not horizontally rugose. Inflorescence branched to above the middle, 4–15 cm long, narrow throughout to broadly ovate in outline, the perigynia close-set, disposed divaricately from the axis and the spikes burlike. Some spikes staminate terminally (difficult to discern unless staminate flowers at anthesis). Pistillate scales ovate to oblong-ovate, with a narrow green median and scarious sides, apically acuminate to cuspidate to aristate, reaching the base of the beak of the perigynium or nearly so. Perigynia 6–8 mm long overall, narrowly stipitate below then abruptly and conspicuously expanded into a nearly circular, thickish disklike base, then abruptly narrowed distally to a strongly nerved, (in outline) nearly conical portion of the body, again narrowed to a stiff, subulate beak scabrid on its edges, beak much longer than the body, 2 erect, subulate teeth at the orifice. Achene lenticular, ovate, body about 2 mm long (not including stipe and apicule), 1.2 mm wide at widest portion thus definitely longer than broad, abruptly narrowed from the widest portion near the base to a short stipe, gradually narrowed distally to an obtuse apex, style disarticulating considerably above the base leaving a longish apicule, surface finely granular, yellow; stipe of achene seated in inflated portion of perigynium, body mostly in portion above that.

Swamp forests, adjacent ditches, clearings of swamps. Coastal plain, Va. to Fla. Panhandle, w. to e., s.e. and n. cen. Tex., northward in the interior to Ohio, s. Mich., Wis. and s. Minn.

2. Carex stipata Muhl. ex Willd. Fig. 244

Similar in general aspect to *C. crus-corvi.* Whitish papery upper portions of leaf sheaths loose, usually horizontally rugose. Pistillate scales ovate to triangular-ovate, apically acute, acuminate-cuspidate to short-aristate, about as long as the body of the perigynium. Perigynia with a narrow (easily detached) stipitate base, thence abruptly inflated distally to an ovate body, this spongy-thickened basally but not disklike and not sharply differentiated from the portion above, more definitely plano-convex than in *C. crus-corvi,* moderately strongly nerved on the convex side, smooth or nerved on the flat side, gradually narrowed above into the beak, beak scabrid on its edges, equalling to about twice as long as the body, 2 erect subulate teeth at the orifice. Achene lenticular, body 1.3–1.5 mm long (not including stipe and apicule), the broadest portion equalling or slightly exceeding the length, or barely longer than broad, base broadly rounded to nearly truncate, very abruptly narrowed to a short stipe, the edges of the body rounded-tapered to a broadly rounded summit, style disarticulating just above the base leaving the achene short-apiculate, surface very finely granular, olivaceous to amber-brown. (*C. uberior* (C. Mohr) Mack.)

Stream banks, marshy shores, swampy floodplain or bottomland woodlands, wet hammocks. Most of tem. N.Am. (except s.w. U.S. and Mex.).

3. Carex laevivaginata (Kükenth.) Mack. Fig. 244

In general features very much similar to *C. stipata.* Leaf sheaths much more closely surrounding the stem, their ventral surfaces more chartaceous-stramineus, smooth, not horizontally rugose toward the summit, usually concave at the orifice, sometimes with a

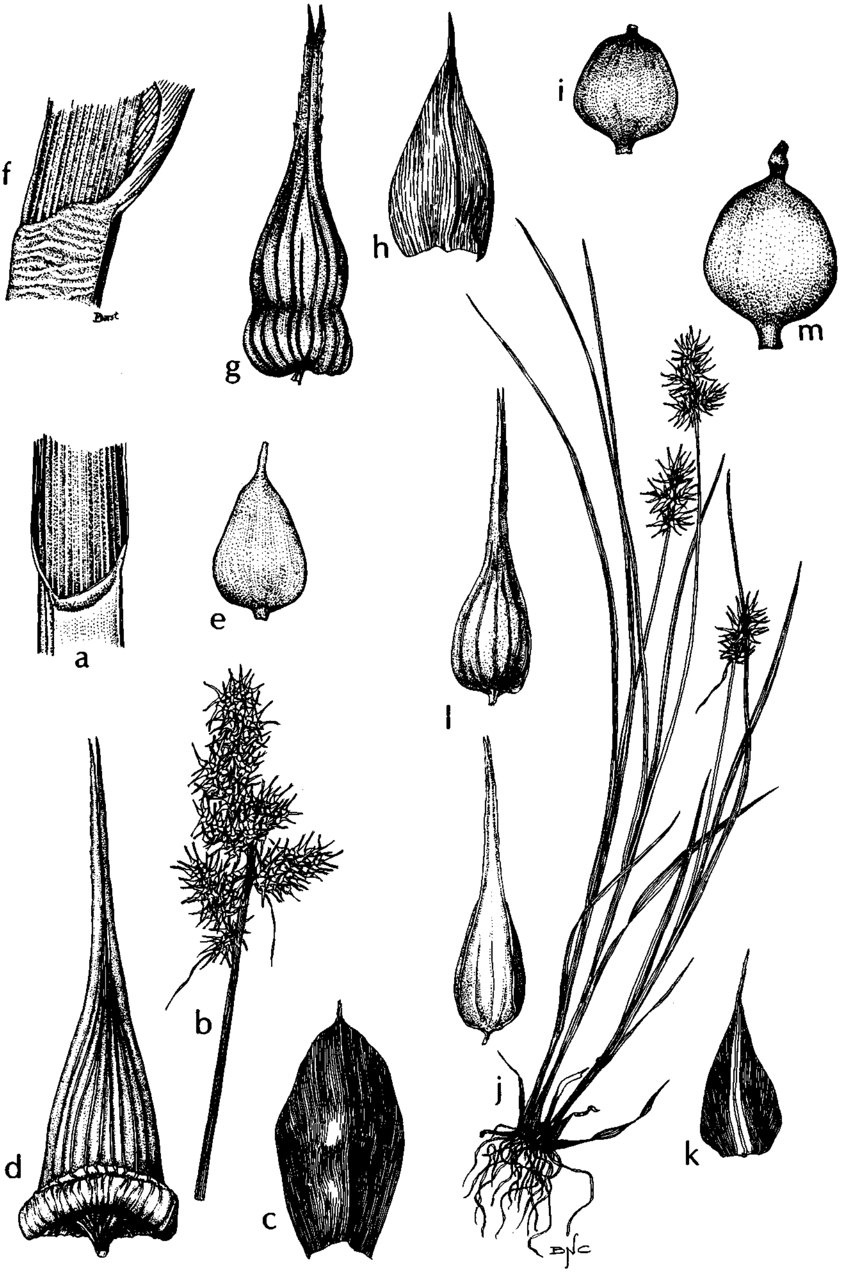

Fig. 244. a–e, **Carex crus-corvi:** a, summit of leaf sheath; b, inflorescence; c, scale; d, perigynium; e, achene; f–i, **Carex stipata:** f, summit of leaf sheath; g, perigynium; h, scale; i, achene; j–m, **Carex laevivaginata:** j, habit; k, scale; l, perigynium (two views); m, achene.

short thick liplike extension, the very summit markedly thickened, the thickening cartilaginous to corky.

Swamps, wet woodlands, stream banks, shores, ditches, meadows, swales. Mass. to Mich. and Minn., generally southward to Ga., n. Fla., Tenn., Mo. and Okla.

4. **Carex decomposita** Muhl. Fig. 245

Cespitose. Stems 5–10 dm tall, slender, shorter than to surpassing the leaves. Principal leaf blades 5–8 mm wide, ventral portion of sheaths whitish-papery, not loose, smooth, red-dotted. Inflorescence branched to above the middle, 5–10 cm long, the lower branches set apart, not bristly nor burlike. Some spikes staminate terminally (easily discernible only when staminate flowers at anthesis). Pistillate scales ovate, acute to short-aristate, about as long as the perigynial body. Perigynia brown at maturity, 2–2.5 mm long overall, body biconvex, obovate, nerved near the base on both sides, narrowly ribbed marginally, abruptly narrowed at the summit to a short-triangular or short-linear, usually finely toothed beak, this shortly bidentate at the orifice. Perigynial wall very thick, closely enveloping the achene. Achene elliptic-obovate, cuneately narrowed below, the broadest portion somewhat above the middle, obtusely tapered at the summit, short-apiculate, about 1 mm long.

Swamps, frequently on floating or partially submersed rotting logs or stumps, often forming dense tussocks in water of swamps and pond margins. N.Y. to Mich., generally southward to n. Fla. and e. Tex.

5. **Carex vulpinoidea** Michx. Fig. 245

Densely cespitose. Stems 3–10 dm tall. Principal leaf blades 2–4.5 mm wide, usually surpassing the flowering stems; ventral portions of leaf sheaths whitish-papery, sometimes red-dotted, sometimes transversely rugose, or transversely lined, or puckered near the summit, the very summit slightly convex, truncate, or extended and liplike. Inflorescence 4–12 cm long, somewhat bristly in superficial appearance the degree depending upon varying lengths of tips of pistillate scales and beaks of achenes; lower and middle divisions of inflorescences composed of closely aggregated spikes on branches to about 1 cm long, becoming less branched or not at all branched terminally. Some spikes with staminate terminal portions (not easily discernible unless staminate flowers at anthesis). Bodies of pistillate scales variable, from ovate and acuminately tapered distally to broadly oblong and rounded to truncate at the summit, the green median forming the tapered tip or the subulate awnlike tip, scale from about ½ as long as the perigynial body to as long as the perigynial beak. Perigynial body plano-convex, narrowly to broadly wing-margined, nerveless to nerved on the rounded side, sometimes nerved on the flat side, varying from broadest at the base to broadest somewhat below the middle or suborbicular, surfaces sometimes red-dotted, tapering at the summit into a triangular beak from ½ as long to nearly as long as the body, beak smooth on the edges to toothed, bidentate at the orifice, perigynia 2.5–3.0 mm long overall. Achene lenticular, 1.0–1.2 mm long, nearly ovate to elliptic-oblong in outline, sometimes narrowed below to a substipitate base, apiculate at the summit, sometimes with an enlarged style base. (Incl. *C. annectens* Bickn.; *C. triangularis* Boeckl.)

Marshy shores of ponds, lakes, sloughs, wet stream banks, wet meadows, prairies, bottomland woodlands, swamps, swales, ditches, old fields. Nfld. to B.C., Wash., Oreg., s. to Fla. Panhandle, w. to Rocky Mts.

6. **Carex fissa** Mack. var. **aristata** Hermann. Fig. 245

Plant somewhat similar in general aspect to *C. vulpinoidea,* usually somewhat coarser. Principal leaf blades 3–5 mm wide, considerably exceeded by the flowering stems; ventral portion of leaf sheath white-papery, usually lined-rugose at least near the summit, not red-dotted. Inflorescence short, 2–4.5 cm long, 8–15 mm wide, spikes congested. Body of pistillate scales ovate to ovate–oblong, obtusely angled at the summit, sides hyaline, narrow median green, extended beyond the body as a finely

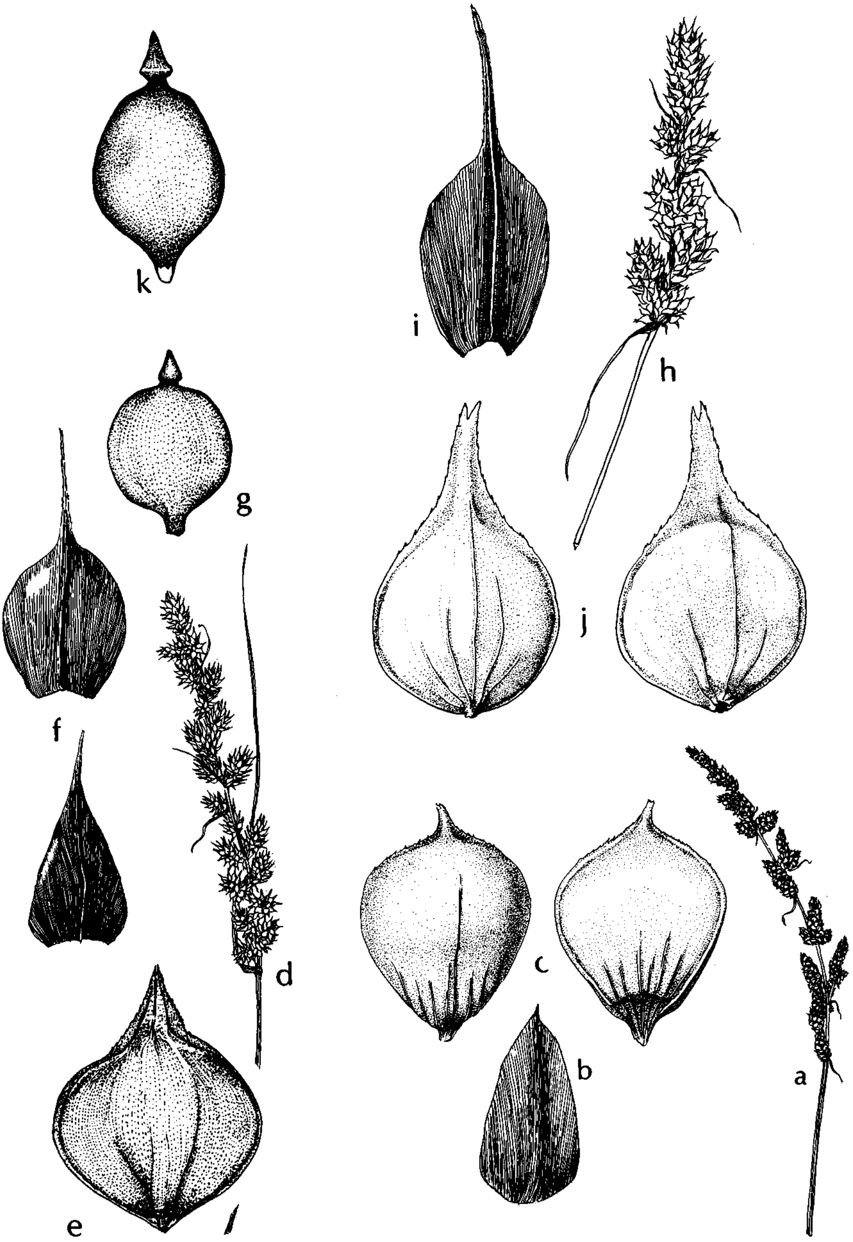

Fig. 245. a–c, **Carex decomposita:** a, inflorescence; b, scale; c, perigynium (two views); d–g, **Carex vulpinoidea:** d, inflorescence; e, perigynium; f, variable scales; g, achene; h–k, **Carex fissa** *var.* **aristata:** h, inflorescence; i, scale; j, perigynium (two views); k, achene.

toothed subulate tip ⅔ as long as the body to longer than the body, tip of scale somewhat exceeding the beak of the perigynium. Perigynial body broadest at about the middle, as broad as long or nearly so, plano-convex, very narrowly wing-margined, the base broadly obtuse to truncate or subcordate, beak triangular, toothed, about ½ as long as the body, bidentate at the orifice, 2–5 fairly definite nerves on the convex surface, nerveless or 3-nerved on the flat surface; perigynium about 3 mm long overall. Achene lenticular, about 1.8 mm long, amber-brown, filling the perigynial body, slightly ovate to suborbicular in outline, abruptly narrowed to a substipitate base, apically with a persistent enlarged style base.

Wet woodlands, pine flatwoods, wet clearings and ditches. N. and n. cen. pen. Fla.

7. **Carex bromoides** Schk. in Willd. Fig. 246

Slenderly rhizomatous and mat-forming. Stems slender, 3–7 dm tall, considerably surpassing the leaves. Principal leaf blades 1–2 mm wide, soft and flexuous. Spikes usually 1–6, sessile, strongly ascending, approximate or overlapping, sometimes somewhat distant, narrow, loosely flowered, mostly 1–2 cm long, some spikes staminate basally (not easily discerned unless staminate flowers at anthesis). Pistillate scales lance- or elliptic-oblong, somewhat keeled, with a narrow green median and hyaline sides, cuspidate apically, about the length of the perigynial body. Perigynial body partially and obscurely plano-convex, wall thin, lanceolate in outline, usually more strongly and regularly nerved on the abaxial side, abruptly narrowed into a beak toothed on its edges, beak from nearly ½ to ⅓ as long as the body, sharply short-bidentate at the orifice, length overall 4.5–5.5 mm. Achene lenticular, ovate-oblong, shortly tapered below the widest portion not far above the base, with a little taper distally, the summit rounded, style base sometimes remaining for a time, eventually completely disarticulating.

Floodplain and low woodlands, also mesic woodlands. N.B. to Wis. generally southward to n. Fla. and La.; Mex.

8. **Carex seorsa** Howe in Gordinger & Howe. Fig. 247

Habit very much similar to that of *C. atlantica.* Inflorescence with 3–7 remote, short spikes, the uppermost sometimes with a narrowly turbinate staminate portion at the base. Pistillate scales ovate to oblong-ovate, apically obtuse to rounded, the green median not reaching the summit and with a central fine white nerve, sides whitish-hyaline, shorter than the perigynia. Perigynia essentially plano-convex, the convex side usually curving downward to a sharp edge so that flat side may sometimes appear "inserted," nearly lance-ovate in outline, abruptly tapered below to a stipitate base, gradually tapered above into a very short beak, edges of beak smooth, short bidentate at the orifice, 2–3 mm long overall; several nerved, nerves very variable in length on both faces; perigynial wall thin. Achene lenticular, about 1.2 mm long, nearly as broad basally, ovate, pale brownish, substipitate basally, a short dark basal portion of the style persisting at the obtuse summit.

Swamps, wet woodlands, banks of woodland streams. Mass. to Fla. Panhandle; N.Y. to Mich.

9. **Carex atlantica** Bailey. Figs. 248 and 269

Densely cespitose. Stems very slender, 3–7 dm tall. Principal leaf blades 2–4 mm wide, scabrid on the margins distally, ventral portion of sheaths hyaline or papery, sometimes thickened at the very summit. Inflorescence of 3–5 short, sessile spikes approximate or remote, uppermost usually with a turbinate staminate portion basally, others usually wholly pistillate. Pistillate scales ovate, with a narrowly triangular green median, sides hyaline, apically obtuse to acute, shorter than the perigynia. Body of the perigynium broadly ovate, broader than long, essentially plano-convex but convex side usually compressed forming a sharp margin and subcordate base, the flat side thus sometimes appearing inserted and with point of attachment above its base (seen from convex side this configuration results in base of perigynium appearing pale and empty and the

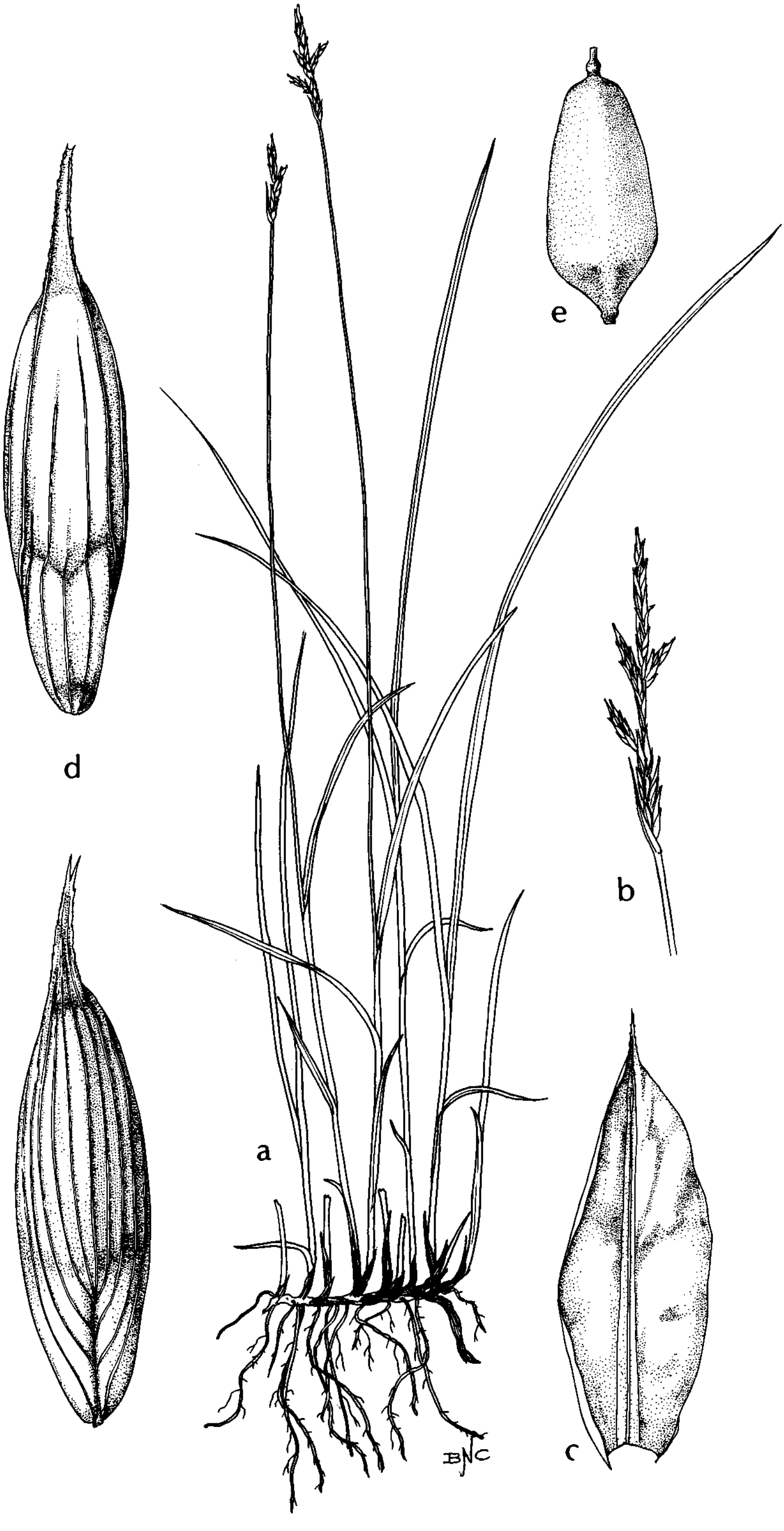

Fig. 246. **Carex bromoides:** a, habit; b, inflorescence; c, scale; d, perigynium (two views); e, achene.

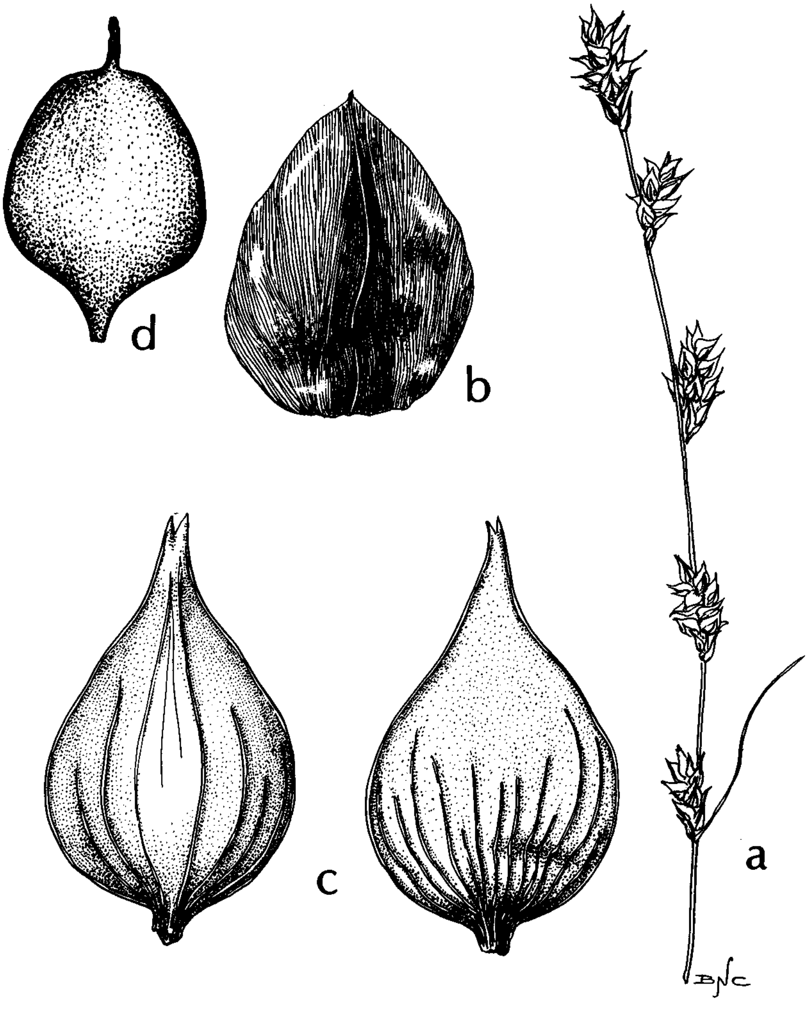

Fig. 247. **Carex seorsa:** a, inflorescence; b, scale; c, perigynium (two views); d, achene.

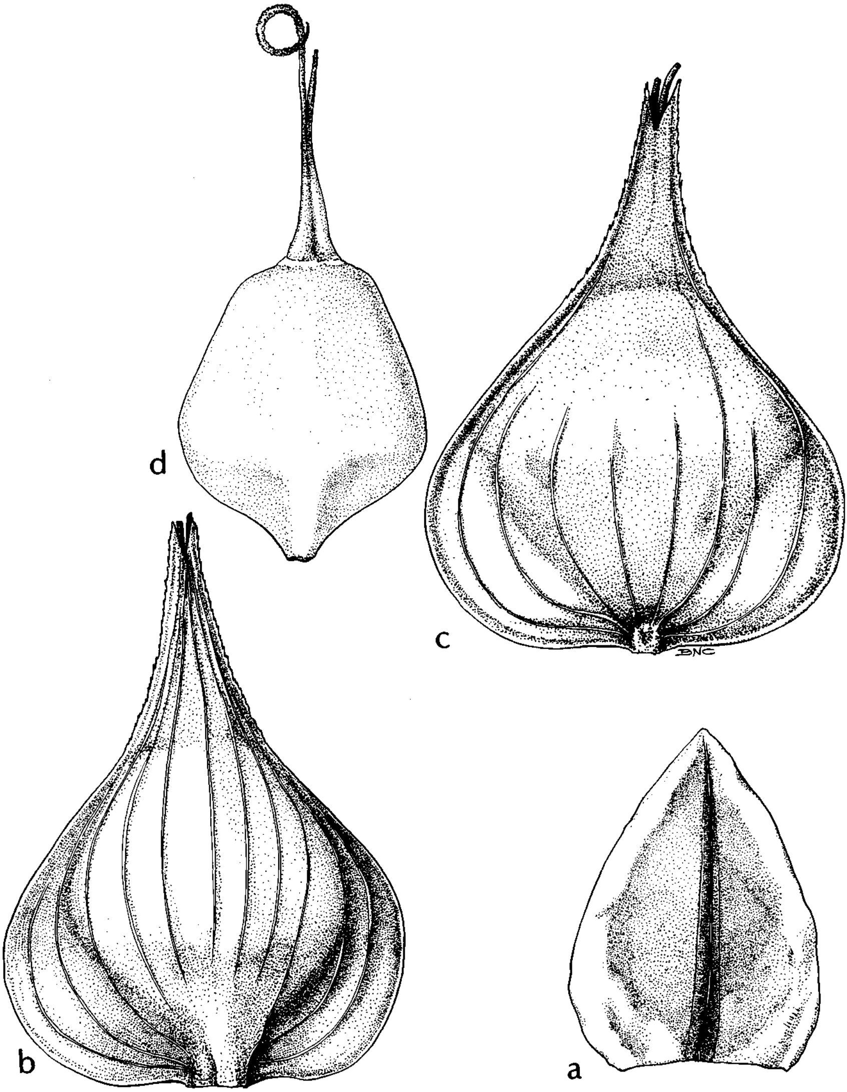

Fig. 248. **Carex atlantica:** a, scale; b–c, perigynium (two views); d, achene.

achene, showing through, in the upper ⅓–⅔ of the body, bulging its wall somewhat and giving a darker olivaceous color; differential compression, however, varies the configuration considerably); perigynium strongly nerved, tapering distally into a toothed beak ¼–½ as long as the body, strongly bidentate at the orifice, the teeth erect; perigynium 3.0–3.5 mm long overall. Achene lenticular, about 1.5 mm long, broadest somewhat below the middle, tapering below to a substipitate base, tapering somewhat less above to a truncate apex, style or portion of it sometimes persisting for a time but eventually disarticulating leaving at most a short collarlike projection. (Incl. *C. incomperta* Bickn.)

Bogs, banks of woodland streams, springy places, boggy or marshy shores. N.S., N.B. and Que., w. to s. Mich., generally southward to n. Fla., e. and s.e. Tex.

10. Carex howei Mack. Fig. 249

In general aspect similar to *C. atlantica.* Principal leaves narrower, not exceeding 1.5 mm wide, mostly about 1 mm. Configuration of perigynia in general as for *C. atlantica,* body narrower, considerably longer than broad, beak weakly toothed, short-bidentate at the orifice. Perhaps not specifically distinct from *C. atlantica.*

Swamps, wet woodlands, bogs, floodplain forests, cypress-gum ponds and depressions, sometimes abundant on partially submersed rotting logs or about rotting stumps in impoundments. N.S., N.E., N.Y. to Ohio and s. Mich., generally southward to cen. pen. Fla. and La.

11. Carex tribuloides Wahl. Fig. 249

Cespitose. Stems 4–12 dm tall, slightly surpassing the leaves to overtopped by them, scabrid on the angles below the inflorescence. Principal leaf blades 3–7 mm wide. Sheaths rather loose, ventrally ribbed except for a **V**-shaped hyaline portion just below the orifice. Spikes 5–12, ovoid, subglobose, oblong, or obovate, separate or close together, sometimes compactly aggregated, densely many-flowered, some staminate basally. Pistillate scales ovate, apically acute to acuminate, much shorter than the perigynia. Perigynia 3–5 mm long, thin, nearly lanceolate but sometimes broadest just above the middle, narrowly wing-margined above the middle, the wing narrowing abruptly from about the middle downward, scarcely if at all winged at the base, body gradually tapering into a flat, triangular beak with a toothed margin, bidentate at the orifice. Achene occupying ½ of the perigynium in the lateral dimension or a little less, lenticular, elliptic-oblong, 1.5 mm long or a little more, 0.4–0.7 mm wide, substipitate at the base, style disarticulating above the base leaving the achene apiculate, surface granular, olivaceous to amber-brown.

Floodplain forests, low woods, stream banks, swales, wet meadows, marshy shores. N.B., Que., to Minn., Nebr., generally southward to Fla. Panhandle and s.e. Tex.

12. Carex scoparia Schk. Fig. 250

In general habital appearance similar to *C. tribuloides.* Leaf sheaths tight, hyaline-papery ventrally. Spikes rather bristly owing to the stiff long-tapering perigynial tips. Pistillate scales oblong below, long-acute distally, a little more than ½ as long as the perigynia. Perigynia about 5 mm long, lanceolate, achene occupying about ½ of the body in the lateral dimension, the distal taper of the entire perigynium elongate and gradual from the widest portion to the tip of the beak, finely toothed marginally from about the middle to the barely bifid tip, wing-margined, the wing continuous to the base. Achene about 1.5 mm long, elliptic-oblong, long-stipitate at base, style apparently persistent, sometimes bent, about as long as the achene body, surface of achene brown amber, lustrous.

Marshy shores of lakes, ponds, streams, bogs, boggy meadows, thickets, open moist woodlands. Nfld. to B.C., generally southward to S.C., Tenn., Ark., N.Mex., Ariz.; Oreg.

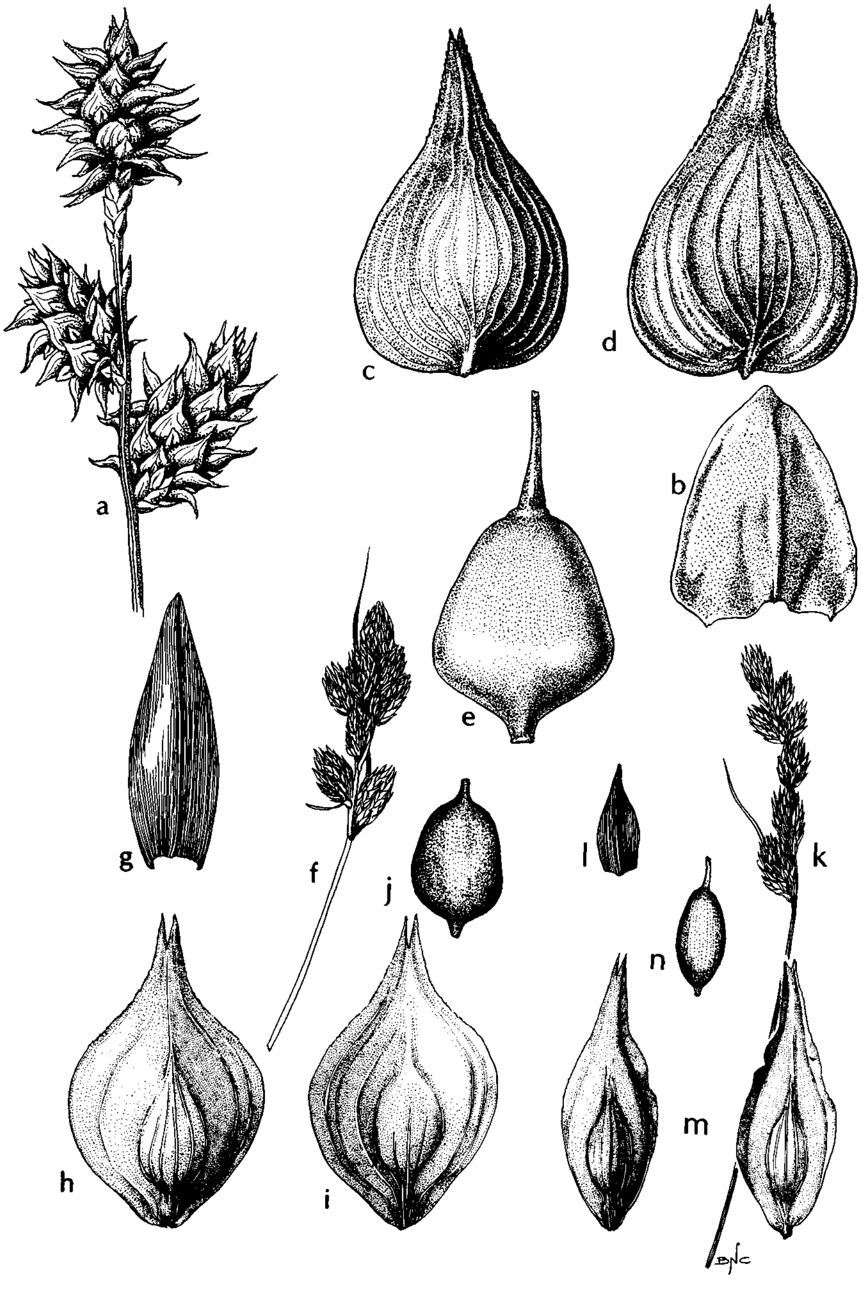

Fig. 249. a–e, **Carex howei:** a, inflorescence; b, scale; c–d, perigynium (two views); e, achene; f–j, **Carex albolutescens:** f, inflorescence; g, scale; h–i, perigynium (two views); j, achene; k–n, **Carex tribuloides:** k, inflorescence; l, scale; m, perigynium (two views); n, achene.

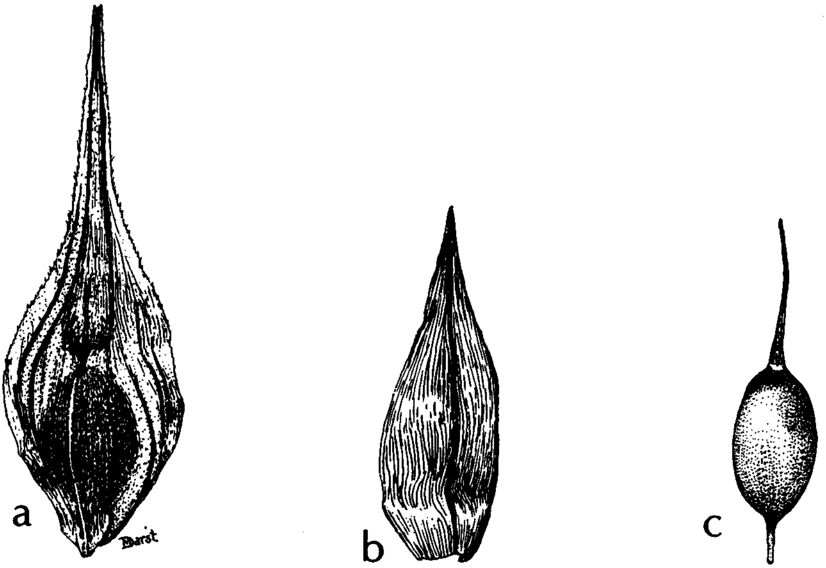

Fig. 250. **Carex scoparia:** a, perigynium; b, scale; c, achene.

13. Carex festucacea Schk.

Cespitose. Stems 4–10 dm tall. Principal leaf blades 2–5 mm wide. Spikes 3–7, sessile, approximate or somewhat separated, 6–10 mm long, usually turbinate basally, sometimes rounded or truncate. Pistillate scales ovate, oblong-ovate, or lanceolate, much shorter and narrower than the perigynia. Perigynia 3–3.5 mm long overall, body little longer than broad, varying from ovate to orbicular to obovate in outline, margins winged throughout, abruptly narrowed distally into a short-triangular beak. Achene occupying about ½ of the perigynium in the lateral dimension, 1.5 mm long, 1.0–1.2 mm broad, essentially oblong in outline, slightly narrowed basally, the apex broadly rounded to subtruncate, style disarticulating above the base and leaving the achene apiculate, surface with faint longitudinal lines, granular between, sublustrous, amber brown.

Floodplain forests, low woodlands, moist open areas, swales, mesic woodlands. N.S. to Mich., Iowa, generally southward to n. Fla. and Okla.

14. Carex normalis Mack.

In most features closely similar to *C. festucacea* and perhaps not specifically distinct. Perigynial body more consistently ovate in outline, distally tapering gradually into an elongate-triangular or subulate beak.

Swampy and wet woodlands, bogs, seepage areas, meadows, prairie swales, along small streams, moist to wet roadside and railroad rights-of-way, sometimes in dry open woods and clearings. N.B. to Man., generally southward to N.C., Mo., Kan., Ark.

15. Carex albolutescens Schw. Fig. 249

Densely cespitose. Stems 3–8 dm tall, much exceeding the leaves. Principal leaf blades 2–4 mm wide. Spikes mostly 3–6, sessile, approximate or a little interrupted, ovate, short-oblong, suborbicular, to 12 mm long, usually rounded basally and apically, sometimes narrowed basally, some spikes with basal turbinate staminate portions. Pistillate scales ovate-lanceolate, with narrow green median and hyaline sides, about as long as the perigynia but narrower, acute to acuminate apically. Perigynia mostly 4–5 mm long overall, body usually obovate, sometimes oval in outline, broadest above or at the middle, broadly winged, abruptly to gradually narrowed distally into a short, flat, triangular finely toothed beak strongly bidentate at the orifice. Achene occupying little more than ⅓ of the perigynium in the lateral dimension, lenticular, ovate in outline, 1.5–2.0 mm long, about 1 mm broad, narrowed below to a short-stipitate base, little narrowed from the broadest portion near the base to a rounded apex, style disarticulating near its base leaving the achene short-beaked, surface finely granular, dull amber brown. (*C. straminea* of authors, not Willd.; incl. *C. longii* Mack.)

In a wide variety of moist to wet habitats, both wooded and open, commonly weedy in disturbed sites. N.S. to Ind., Mich. and Sask., southward in the coastal plain and piedmont to cen. pen. Fla., w. to e. and s.e. Tex.; trop. Am.

16. Carex reniformis (Bailey) Small. Fig. 251

Similar to *C. albolutescens* in general habital features. Spikes 3–7, 6–12 mm long, some or all with turbinate staminate basal portions, pistillate portions ovoid to short-oblong or subglobose, approximate or a little separated. Pistillate scales ovate-oblong, acute apically or tapered to a blunt tip, ½ as long as the perigynia or a little more, with a narrow green median and hyaline sides. Perigynia 4–5 mm long overall, body thin, flat, broadest at or slightly below the middle, as broad as long and orbicular in outline, or broader than long and sometimes approaching kidney-shaped, sometimes slightly longer than broad, broadly winged, achene centrally occupying ⅓ or less of the body in the lateral dimension, perigynial wall, over the achene, hyaline, either side of that the wing with a rather broad yellow band, outwardly a narrower pale green band, finally a marginal hyaline border whose edge is very finely toothed; beak short, triangular-subulate, finely toothed on its margin, bidentate teeth at the orifice mostly erect-

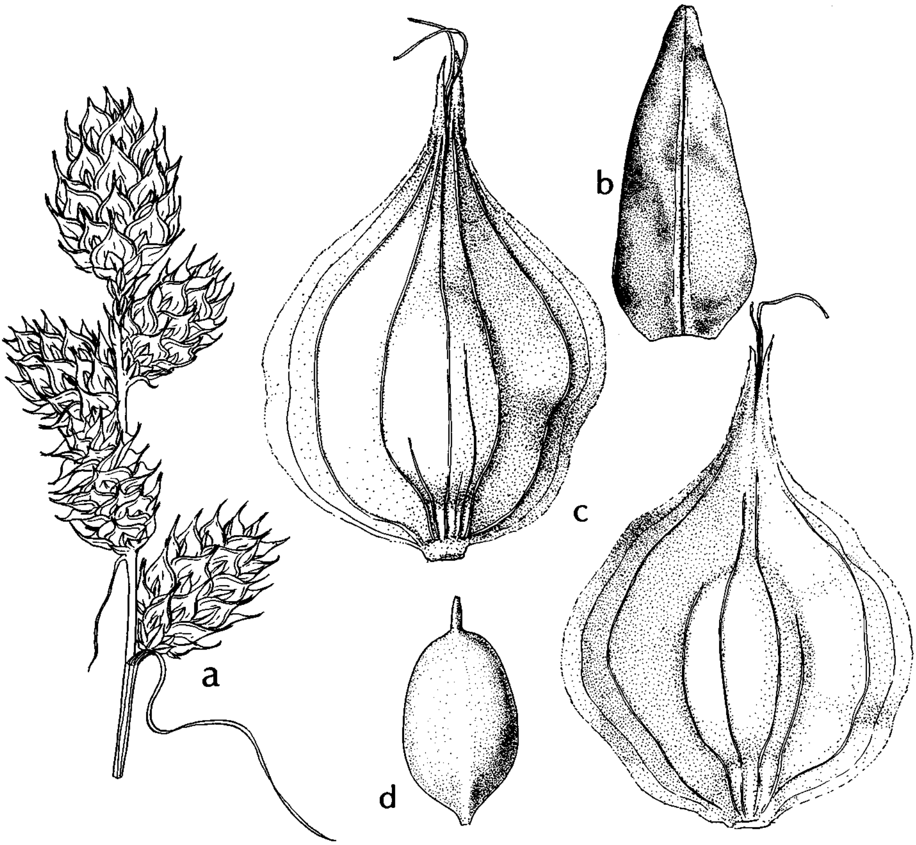

Fig. 251. **Carex reniformis:** a, inflorescence; b, scale; c, perigynium (two views); d, achene.

connivent. Achene lenticular, elliptic-oblong, obtusely narrowed to a substipitate base, rounded to subtruncate at the summit, style disarticulating above the base leaving a longish apicule, surface somewhat granular, amber brown, about 3 mm overall.

Floodplain forests, lowland woods, adjacent wet clearings and ditches, marshy sloughs, alluvial ephemeral pools. Va. to cen. pen. Fla., w. to Ark., Okla., Tex., N.Mex.

17. Carex alata Torr. Fig. 252

In general habital appearance similar to *C. albolutescens* and to *C. reniformis.* Pistillate scales lanceolate to lance-ovate, apically short-aristate, overall about the length of the perigynial body. Body of perigynia flat, usually broadest just above the middle, essentially obovate in outline, broadly tapered below the widest portion to a blunt to rounded base, tapered above into a short-triangular beak bidentate at the orifice; achene centrally occupying about ¼ of the perigynial body in the lateral dimension; perigynium broadly winged, 4–5 mm long overall, body as broad as long or nearly so; perigynial wall hyaline centrally over the achene, a broad buffish opaque band either side, outwardly an equally wide thinner green band (sometimes semitranslucent) which is irregularly opaque-nerved, the edges finely toothed from about the middle upwardly throughout the edges of the beak. Achene closely similar to that of *C. reniformis.* (Possibly including *C. vexans* Hermann)

Cypress or cypress-gum ponds, often about the bases of trees or on rotting stumps or logs, floodplain and low woodlands, marshes and marshy shores, meadows. Mass., N.Y., Pa., s. to cen. pen. Fla., w. to Tex.; from N.Y. to Ind., Mich., Mo.

18. Carex crinita Lam.

Densely cespitose. Stems 5–12 dm tall. Principal leaf blades 5–10 mm wide, sheaths smooth or finely hispid, the lower commonly brown to reddish purple. Staminate spikes 1–3; terminal, stalked, sometimes some mostly staminate spikes pistillate below, staminate above. Pistillate spikes 2–5, usually approximate, linear-cylindric, 3–10 cm long, usually curved and drooping on slender stalks. Body of pistillate scales roughly oblong to narrowly obovate, retuse at the summit to shortly tapered or truncate, the green median extending well beyond the body as a rough subulate awn, the entire scale equalling or usually much longer than the perigynum and the tips of all the scales together giving the spike a bristly appearance. Perigynia sometimes somewhat inflated, 2-ribbed, sometimes nerved as well, lance-ovate, elliptic, obovate, or suborbicular, abruptly narrowed at the summit into a very short nonbidentate beak. Achene lenticular, constricted on one or both sides near the middle or not constricted, obovate, ovate, or suborbicular, surface dull-brown.

Marshy shores, wet woodlands, bogs, swales. Nfld. to Minn., generally southward to n. Fla. and La.

Variation in several characters and combinations of characters have led authors to segregate what is generally described above into several taxa, some at species or varietal level, some at the varietal level. The three most often recognized (although they intergrade) are: *C. crinata* var. *crinita; C. gynandra* Schw. (*C. crinata* var. *gynandra* (Schw.) Schw. & Torr.); *C. mitchelliana* Curtis (*C. crinita* var. *mitchelliana* (Curtis) Gl). The following may serve to distinguish them should one choose to recognize segregates:

var. *crinita.* Leaf sheaths smooth; perigynia nerveless; achene constricted on one or both edges.

var. *gynandra.* Leaf sheaths finely hispid; perigynia nerveless; achene constricted on one or both edges.

var. *mitchelliana.* Leaf sheaths finely hispid; perigynia nerved; achene with a constriction.

19. Carex stricta Lam.

Plants with descending rhizomes, eventually forming tussocks or stools, or colonies of small tussocks, basally rich reddish brown and with conspicuous bladeless sheaths.

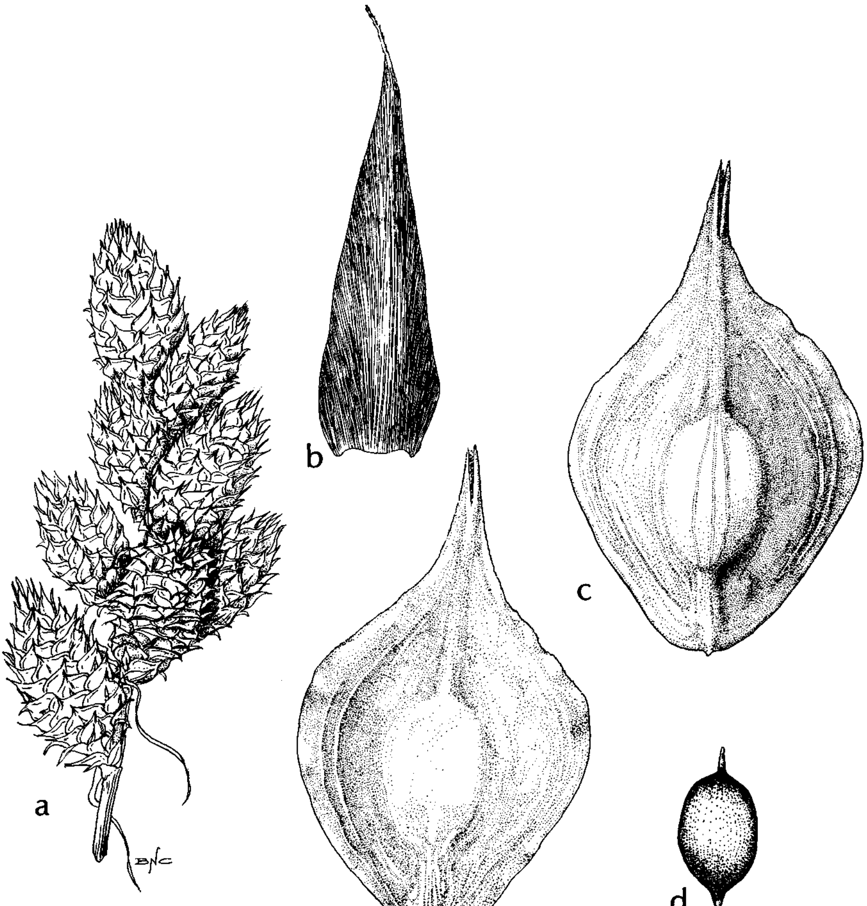

Fig. 252. **Carex alata:** a, inflorescence; b, scale; c, perigynium (two views); d, achene.

Stems 5–8 dm tall. Principal leaf blades 2–5 mm wide. Wholly staminate spike usually solitary, its stalk from below the uppermost pistillate spike and extending beyond it, sometimes branched basally. Other spikes usually 2–4, pistillate throughout or sometimes staminate terminally, erect, narrowly cylindric, sessile or the lowest short-stalked, brown, 2–7 cm long. Pistillate scales variable, from short-oblong to linear-oblong and acute to acuminate, shorter than to a little longer than the perigynia, green or pale medially, rich chestnut to purplish brown on the sides, the margins sometimes scarious or hyaline. Perigynia mostly plano-convex, often asymmetric, obovate to broadly elliptic in outline, obtusely narrowed at the summit, just above the broadest portion, to a nonbidentate beak, ribbed on the two edges, nerveless or irregularly faintly nerved on the faces, green to brown. Achene closely enveloped, lenticular, obovate to nearly spherical in outline, about 1.5 mm long, yellowish to brown, the style jointed a bit above the base, disarticulating and leaving the achene apiculate. (Incl. *C. strictior* Dewey)

Bogs, wet meadows, swamps, floodplains, swales, marshes, wet woodlands. N.B. and Ont. to Minn., generally southward to N.C., Tenn., Mo.

20. Carex leptalea Wahl. Fig. 253

Plant slenderly rhizomatous. Stems slender, in tufts along the rhizomes, eventually forming dense clumps, 1–4 dm tall, equalling or exceeding the leaves. Principal leaf blades 1 mm wide or less, lower sheaths bladeless. Spikes solitary and terminal, lanceolate to linear, 5–12 (–18) mm long, some of them with terminal staminate portions, with few loosely disposed pistillate flowers. Staminate scale margins united basally; pistillate scales keeled, oblong to obovate, ½ as long as the perigynia to much less, the lower longer than the upper, apically obtuse to rounded, sometimes mucronate, with a narrowly triangular green median, hyaline on the sides. Perigynia 3.5–6 mm long, lanceolate or nearly so in outline, obscurely 3-angled, turbinate at the base, blunt at the summit, nerved, achene occupying about ½ of the perigynium in the vertical dimension. Achene brown, 2 mm long, narrowly obovate in outline, obtusely 3-angled, one face flat, other two rounded to concave, style disarticulating above the base leaving the achene short-apiculate.

Sphagnous bogs, swamps, floodplain forests, seepage areas on and at bases of slopes and ledges, wet woodlands, sometimes mesic woodlands. Lab. to Alaska, s. to cen. pen. Fla., Tex., N.Mex., Colo., n. Calif.

21. Carex complanata Torr. & Hook. Fig. 254

Cespitose, bases relatively hard. Stems slender, 3–8 dm tall, usually surpassing the leaves. Principal leaf blades 2–4 mm wide, sometimes pilose or hirsute on sheaths and lower parts of blades, basal sheaths commonly reddish purple. Spikes usually 3, approximate, but varying from 1–5 cm long, sessile or subsessile, usually compactly-flowered. Pistillate scales oblong to ovate, with a triangular green median, hyaline sides, apically acute, acuminate, or short aristate, half as long to as long as the perigynia. Perigynia about 2.5 mm long, 3-angled, one face flat, other two sloping, but usually misshapen from shrinking, weakly nerved to nerveless, the empty base narrowed and shrunken in drying, obtusely tapered distally from the widest portion to an obtuse to rounded tip, beakless, sometimes barely emarginate at the orifice. Achene narrowly obovate in outline, 2 mm long or a little more, strongly 3-angled, the angles rounded, faces usually concave, cuneate below, obtuse apically, style disarticulating and leaving a short, bent apicule at the summit, surface pale, dull green. (Incl. *C. hirsutella* Mack.)

Well drained sites, open woodlands, clearings, fields, natural levees, sometimes (in southern parts of range at least) in bottomland or floodplain woodlands where flooding is infrequent and for very short periods. Maine to Mich. and Mo., generally southward to n. Fla., e. and s.e. Tex.

22. Carex caroliniana Schw. Fig. 254

Very closely similar in habital appearance to *C. complanata*. Pistillate scales ovate to

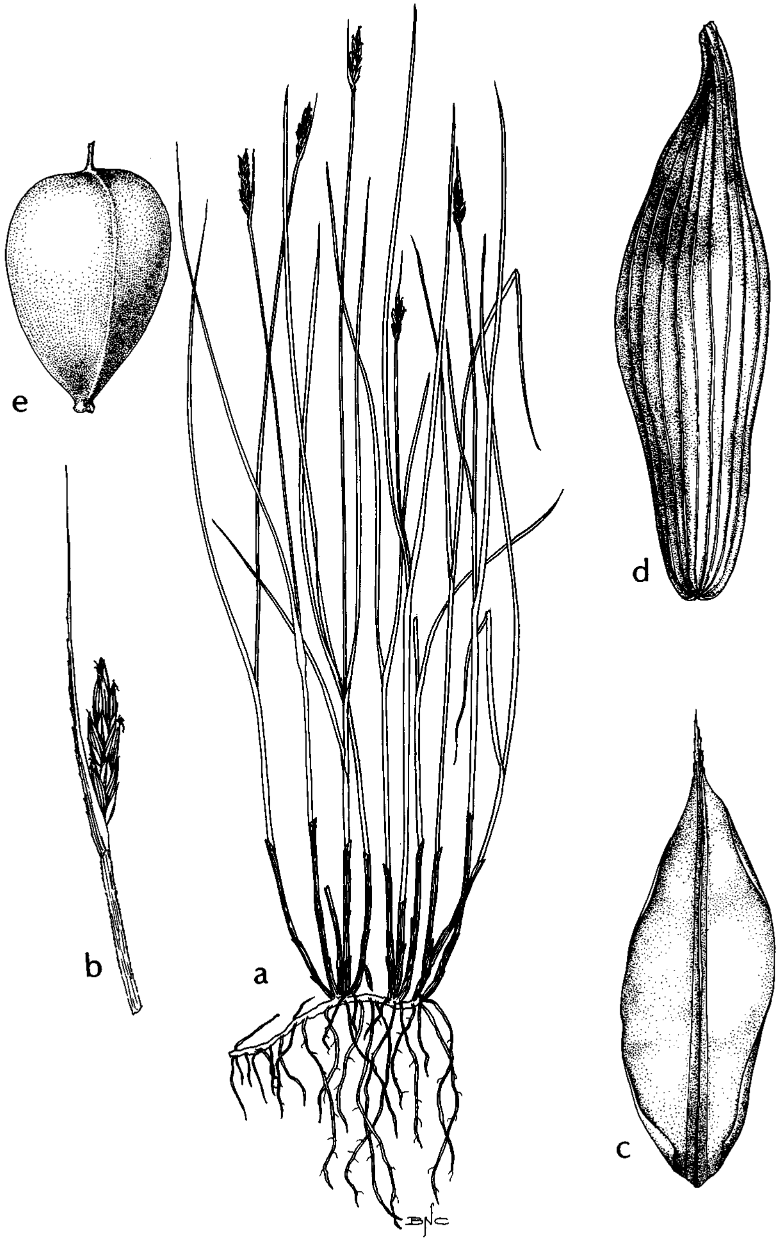

Fig. 253. **Carex leptalea:** a, habit; b, inflorescence; c, scale; d, perigynium; e, achene.

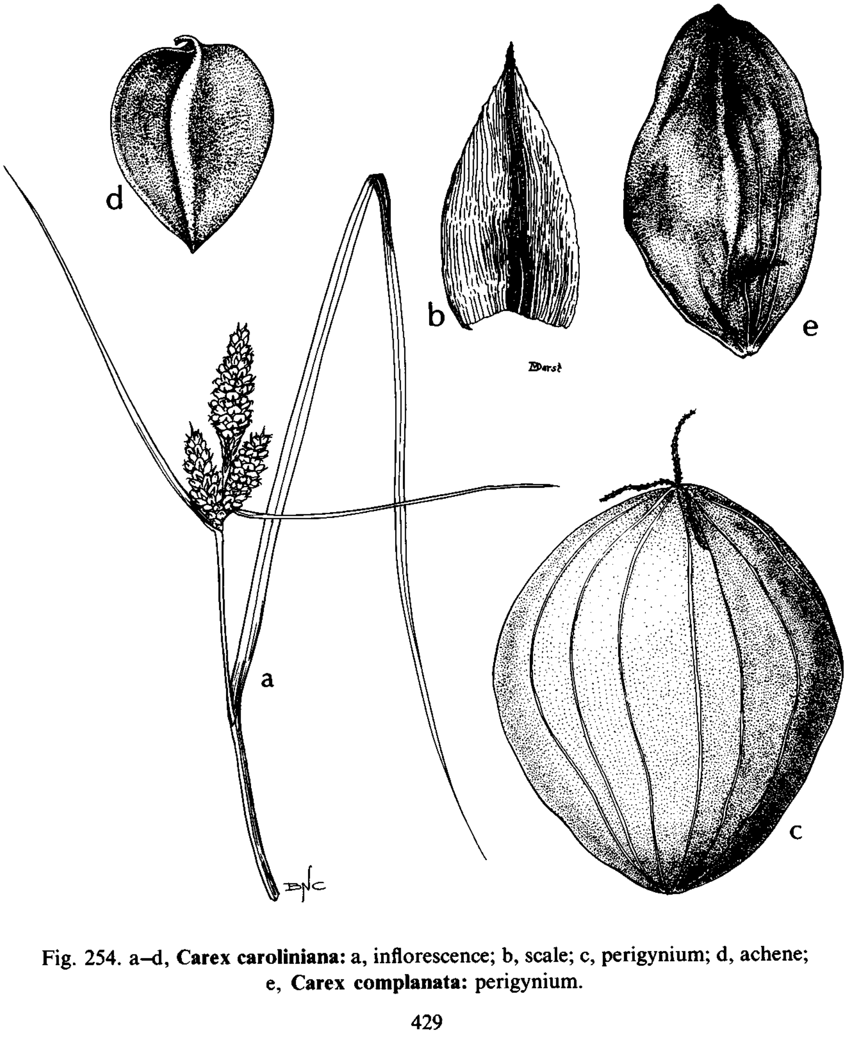

Fig. 254. a–d, **Carex caroliniana:** a, inflorescence; b, scale; c, perigynium; d, achene; e, **Carex complanata:** perigynium.

oblong-obovate, narrowed distally to an obtuse or mucronate tip, about ½–⅔ as long as the perigynia. Perigynia disposed from the axis at right angles, broadly obovate in outline, the broadest, inflated portion near the summit and as broad as the perigynium is long, very shortly and abruptly narrowed distally from the broadest portion and with a barely apiculate beak; perigynium seen from above appearing nearly circular, in side view tapered below the widest portion and markedly shrunken in drying, 2 mm long and wide, surface nerved, sometimes strongly, sometimes weakly. Achene about 1.8 mm long, broadly obovate in outline, nearly as broad at broadest place as long, markedly 3-angled, the faces flat or only slightly concave, angles pale, faces brown, summit truncate, style disarticulating above the bent base leaving a bent apicule.

Floodplain forests, low woodlands, moist to wet clearings, banks, meadows, prairies. N. N.J. to Ind. and Mo., generally southward to Fla. Panhandle, e., s.e., and n. cen. Tex.

23. **Carex oxylepis** Torr. & Hook. Fig. 255

In general habital appearance closely similar to *C. venusta* and *C. debilis.* Bases more distinctly rhizomatous and forming loose clumps. Leaf sheaths and at least lower portions of the blades pilose on the margins, sometimes pilose on the surfaces as well. Terminal spike usually staminate below and pistillate above; pistillate spikes narrowly oblong-cylindric, 20–40 mm long, 3–4 mm wide, flexuous, the lower at least on slender, flexuous stalks, somewhat nodding. Perigynia 3.5–4.0 mm long or a little more, glabrous, nerved, olivaceous and sometimes somewhat iridescent, oblanceolate to narrowly obovate in outline, 3-angled, tapered from the broadest portion to a blunt base, above gradually tapered then abruptly narrowed to a short bidentate beak. Achene stipitate, apically short-apiculate, body about 2 mm long, obovate, 3-angled, the faces concave below, summit rounded, surface finely granular, dull, stramineous to olivaceous.

Floodplain forests, lowland wet and swampy woodlands, sometimes on adjacent mesic wooded slopes. Coastal plain and piedmont, s.e. Va. to n. Fla., w. to e. and s.e. Tex., northward in the interior, Okla., Ark., Tenn., Mo.

24. **Carex cherokeensis** Schw. Fig. 256

Plant with coarse, tough rhizomes, about 1 cm in diameter, usually abundantly clothed with persistent old leaf bases, often forming extensive stands. Stems 3–9 dm tall. Principal leaf blades 3–5 (–7) mm wide, mostly shorter than the inflorescences. Staminate spikes 1–4, the axis slender and flexuous, terminal, usually extending much beyond the uppermost pistillate spike. Pistillate spikes 3–6 (sometimes staminate at the summit), slender-cylindric, 2–4 cm long, the upper sessile or short-stalked, the lower with slender, flexuous stalks, commonly drooping, stramineous at maturity. Pistillate scales oblong or ovate, acute to acuminate apically, with a broad scarious median and hyaline edges, shorter than the perigynia. Perigynia 5–7 mm long overall, somewhat inflated, drying wrinkled, ovate, irregularly few-ribbed or -nerved, gradually narrowed into a short beak which is shortly bidentate at the orifice. Achene obovate to elliptic-obovate in outline, 2–3 mm long, 3-angled, cartilaginous-banded on the angles, brown on the faces, narrowed below, the style jointed somewhat above a bent base, deciduous at the joint leaving a straight to bent beak at the summit of the achene.

Floodplain forests, wet hammocks, moist to wet clearings, mesic woodlands. N.C. to n. Fla., w. to e., s.e., and n. cen. Tex., Okla., Ark., Mo.

25. **Carex amphibola** Steud. Fig. 256

Cespitose, often in large clumps. Stems mostly 3–8 dm tall, bases reddish-purple to brownish, equalling to surpassing the leaves. Principal leaf blades 2–5 (–10) mm wide, blades, sheaths and stems green. Staminate spike solitary, terminal, sessile or short-stalked. Pistillate spikes 3–6, few-flowered, 5–20 mm long, 5–7 mm broad, the lower remote, upper sessile or nearly so, lower usually on slender exserted stalks. Pistillate scales ovate, sides hyaline, median green, apically variable (even in a single spike), obtuse, acute, or aristate, aristate scales nearly as long as the perigynia to somewhat

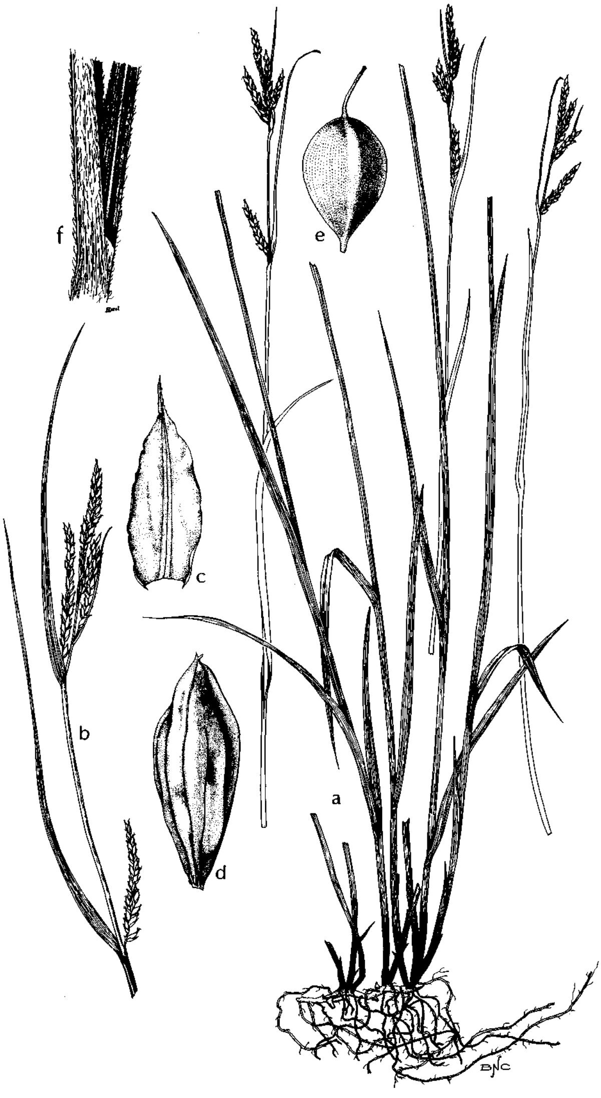

Fig. 255. **Carex oxylepis:** a, habit; b, inflorescence; c, scale; d, perigynium; e, achene; f, enlargement of portion of leaf and stem to show pubescence.

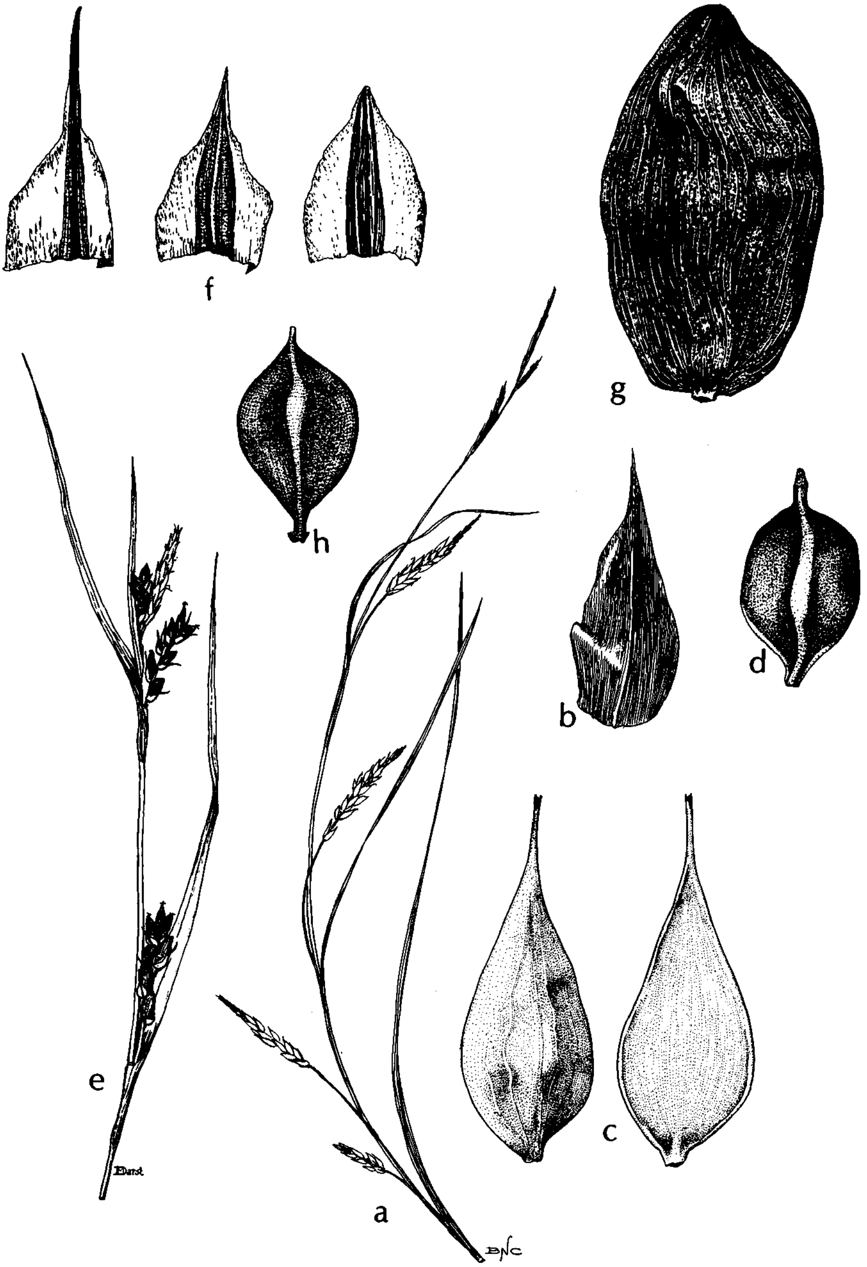

Fig. 256. a–d, **Carex cherokeensis:** a, inflorescence; b, scale; c, perigynium (two views); d, achene; e–h, **Carex amphibola:** e, inflorescence; f, variable scales; g, perigynium; h, achene.

longer than the perigynia. Perigynia about 5 mm long, olivaceous, oblong, rhombic, or narrowly obovate in outline, inflated when fresh, more or less 3-angled when dry, tapering from the broadest portion to a blunt base, apically obtuse, essentially beakless, the orifice entire, surface with many impressed nerves or sometimes with a few elevated nerves and several impressed nerves between. Achene stipitate, apically short-apiculate, body 3-angled, obovate in outline, faces somewhat concave, 3–4 mm long overall, surface finely granular, dull, olivaceous to brown. (Incl. *C. corrugata* Fern., *C. grisea* of authors, not Wahl.)

Floodplain forests, wet and swampy woodlands, marshy stream banks, wet hammocks, wet clearings, sometimes on mesic wooded slopes, commonly where the substrate is somewhat calcareous. N.B. and Que. to Minn., generally southward to n. Fla. and Tex.

26. Carex flaccosperma Dewey. Fig. 257

Plant cespitose. Stems 1.5–5 dm tall. Principal leaf blades 4–10 (–14) mm wide, blades, sheaths and stems slightly to strongly glaucous. Staminate spike solitary, sessile or shortstalked, ascending beside the uppermost pistillate spike, usually little if any surpassing it. Pistillate spikes 3–5, uppermost sessile or nearly so, lower on stalks of various lengths to 5 cm long, the foliar bracts conspicuously exceeding the spikes; spikes 1–5 cm long, about 5–7 mm thick. Pistillate scales ovate, apically variable (even in the single spike), acute, acuminate or short-aristate, usually a little less than ½ as long as the perigynia, occasionally as long as the perigynia, the green median narrow, sides brownish-scarious or -hyaline. Perigynia, in outline, ovate, oblong, rhombic, or nearly cylindric, inflated and nearly round in cross-section when fresh, drying somewhat 3-angled, 4–6 mm long, rounded basally, bluntly tapered distally and essentially beakless, entire at the orifice, surface with many raised nerves. Achene obovate in outline, 3-angled, faces somewhat concave, usually stipitate, with an apicule at the summit, 3–4 mm long overall, surface dull, granular, brown. (Incl. *C. glaucodea* Tuckerm.)

Wooded bottomlands, blackland prairies, moist to wet woodland borders and clearings, adjacent ditches, fields, wet stream banks, meadows, sometimes in mesic woodlands. Mass. and Ont. to s. Ind. and Mo., generally southward to Ga., Fla. Panhandle and Tex.

27. Carex debilis Michx. Fig. 257

Cespitose, the bases reddish purple, to 10 dm tall. Similar in general habital appearance to *C. venusta*. Principal leaf blades 3–5 mm wide, glabrous, usually shorter than the stems, sheaths glabrous. Staminate spike solitary, terminal, long-stalked, very slender, ascending beside and beyond the uppermost pistillate spike, sometimes with some pistillate flowers at its apex. Pistillate spikes 3–4, usually distant, upper sometimes approximate, narrow and elongate, loosely flowered, on slender, flexuous stalks, at least the lower drooping. Pistillate scales ovate to oblong or narrowly obovate, about ½ as long as the perigynia, green medially, the sides whitish-hyaline, apically obtuse to acute. Perigynia substipitate, lanceolate in outline, glabrous or pubescent, 6–10 mm long overall, obscurely 3-angled, 2-ribbed and obscurely nerved between the ribs, gradually tapered into the beak, beak bidentate at the orifice. Achene conspicuously stipitate, stipe 0.5–1.5 mm long, body oblong-elliptic to narrowly obovate in outline, 2–2.5 mm long, 3-angled, commonly with 2 faces flat, apiculate at the summit, surface straw-colored to brown. (*C. allegheniensis* Mack.; *C. flexuosa* Muhl.)

Floodplain forests, wet and swampy lowland woods, boggy or springy areas in woodlands, meadows, wet clearings, sometimes in mesic woods. Nfld. to n. Mich. and Wis., generally southward to cen. pen. Fla., e. and s.e. Tex.

28. Carex venusta Dewey. Fig. 258

Densely cespitose, with reddish purple bases. Stems 4–10 dm tall, surpassing the leaves.

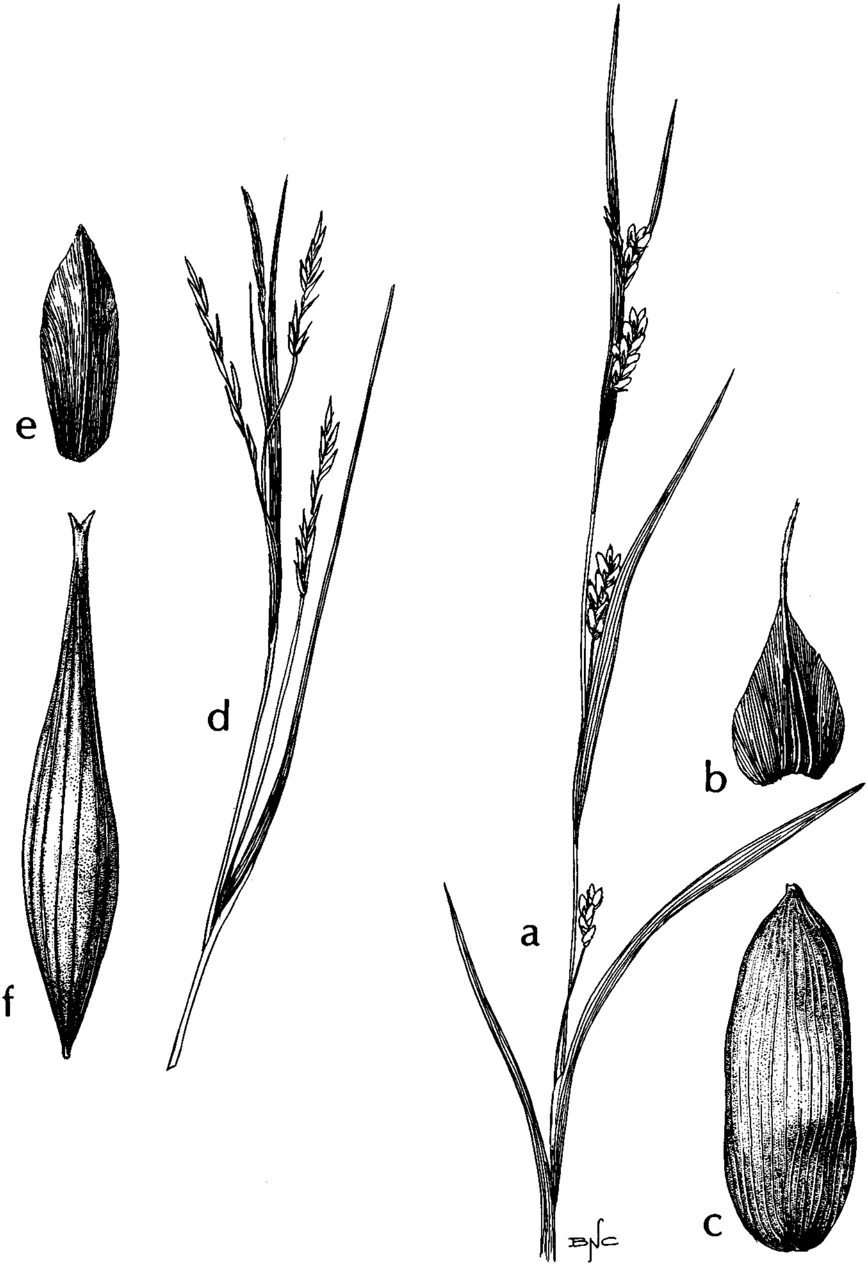

Fig. 257. a–c, **Carex flaccosperma:** a, inflorescence; b, scale; c, perigynium; d–f, **Carex debilis:** d, inflorescence; e, scale; f, perigynium.

Principal leaf blades 3–6 mm wide, glabrous, sheaths glabrous. Staminate spike solitary, from below the uppermost pistillate spike and ascending beside it to much beyond it, occasionally with a few pistillate flowers at the summit. Pistillate spikes 3–4, narrowly oblong-cylindrical, at least the lower well separated, upper short-stalked and erect, lower slenderly long-stalked and drooping. Pistillate scales about ½ as long as the perigynia, ovate-oblong to obovate, with a relatively wide green median, the sides hyaline-scarious, more or less suffused with chestnut-brown, summits rounded, obtuse, or acute, sometimes mucronate, marginally short-lacerate. Perigynia strongly ascending, glabrous or pubescent, conspicuously evenly nerved from base to apex, 5–9 mm long, short-stipitate, lanceolate or lance-elliptic in outline, commonly falcate, gradually narrowed to a short-bidentate beak. Achene filling somewhat more than the lower half of the perigynium, conspicuously stipitate, stipe 0.6–1.5 mm long, body obovate, about 2.5 mm long, straight-apiculate apically, 3-angled, faces concave except at the summit, surface very finely alveolate, olivaceous to brown. (*C. oblita* Steud.)

Sphagnous bogs, boggy places in woodlands, sphagnous pinelands, evergreen shrub-tree bogs and bays. E. N.Y. to Fla. Panhandle and La.

29. **Carex scabrata** Schw.

Plant with long slender rhizomes, the stems in small tufts from the rhizomes, 4–8 dm tall. Principal leaf blades 6–10 mm wide, the margins finely scabrid, the lower sheaths buffish. Staminate spike solitary, short-stalked from below the uppermost pistillate spike and extending beside, usually beyond it. Pistillate spikes 3–8, narrowly cylindrical, 1.5–4 cm long, lower usually long-stalked, upwardly on progressively shorter stalks, the uppermost sessile. Pistillate scales broadest at the base, gradually tapering, about ⅔ as long as the perigynium, medially green, the sides scarious. Perigynia obovate in outline, more or less 3-angled, somewhat inflated, mostly 3–4 mm long overall, ribbed and nerved, pubescent, abruptly narrowed from the widest portion into a beak about ½ as long as the body, beak bidentate at the orifice. Achene closely enveloped, obovate in outline, 3-angled, the angles somewhat swollen centrally and distally, pale, faces concave, dull brown, style deciduous at the rounded summit of the achene thus achene not apiculate.

Wooded spring heads and seepage slopes, wet ledges, banks of woodland streams, boggy areas or ditches below seepage slopes. N.S. and Que. to Mich., generally southward to N.J., Del. and Mo., s. in the mts. to S.C., Ala.

30. **Carex prasina** Wahl.

Cespitose. Stems 3–8 dm tall, exceeded by or surpassing the leaves. Principal leaf blades 3–5 mm wide. Staminate spike solitary, from below the uppermost pistillate spike and ascending beside it, sometimes beyond it, occasionally with a few pistillate flowers at its summit. Pistillate spikes 2–4, subapproximate, narrowly cylindric, on slender flexuous stalks, curved or nodding. Pistillate scales thin, ovate to lance-oblong, equalling or nearly equalling the perigynia, with a green median extending beyond the rounded or retuse hyaline sides as a toothed aristate tip. Perigynia lance-ovate to rhombic-ovate in outline, 2-ribbed, nerveless between the ribs, 3-angled, tapering and curving distally into a short, entire beak. Achene filling somewhat more than the basal half of the perigynium, brown, 1.5–2.0 mm long, obovate in outline, 3-angled, the angles centrally somewhat knobbed, faces slightly concave, style disarticulating just above the base leaving a short apicule at the summit of the achene.

Wooded seepage slopes and stream banks, lowland woodlands, glades. Que. and Maine to s. Ont. and Mich., s. to N.C. and Tenn.

31. **Carex turgescens** Torr. Fig. 258

Loosely cespitose. Stems 3–6 dm tall, slender and flexuous, usually exceeding the leaves. Principal leaf blades 3–7 mm wide, lower portions septate, sheaths pale, somewhat spongy. Staminate spike solitary, from below the uppermost pistillate spike, ascending

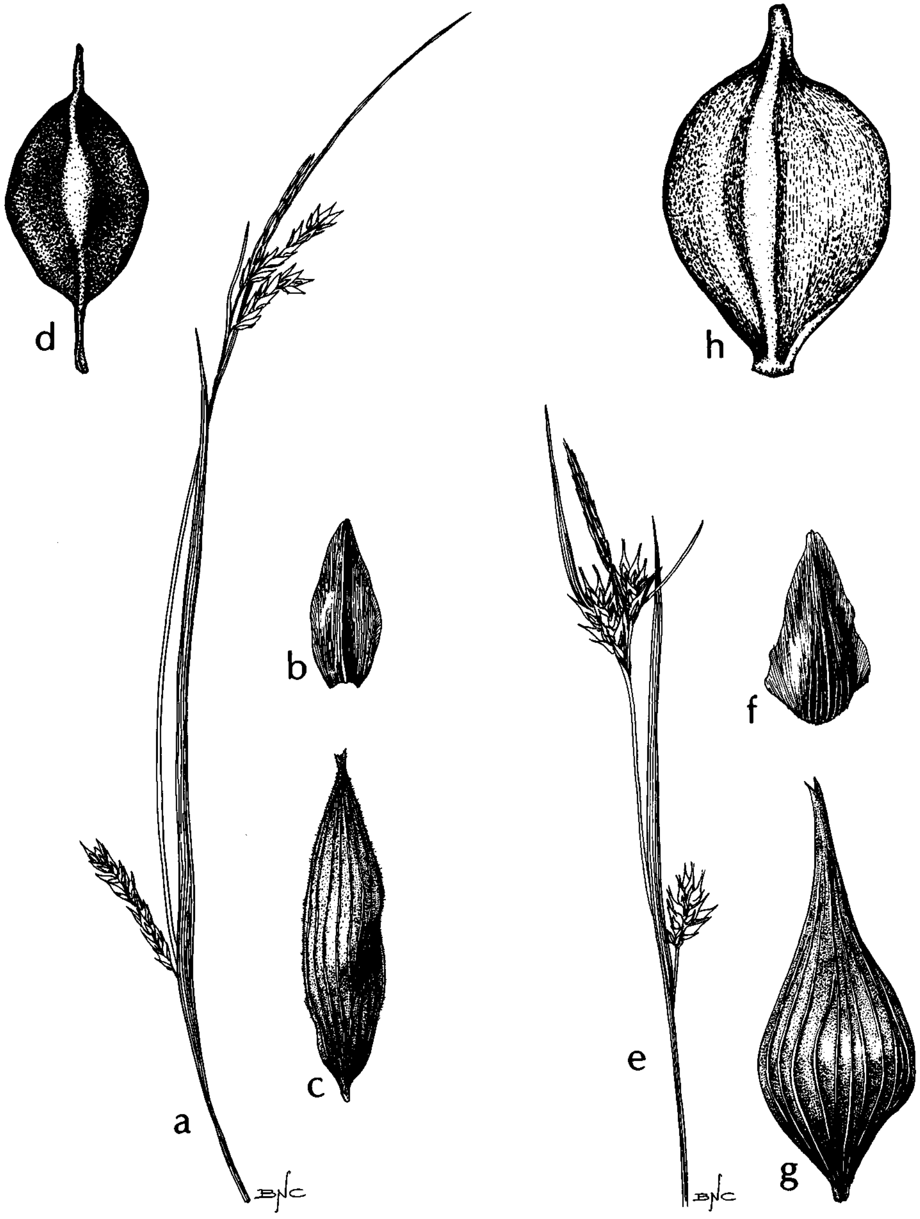

Fig. 258. a–d, **Carex venusta:** a, inflorescence; b, scale; c, perigynium; d, achene; e–h, **Carex turgescens:** e, inflorescence; f, scale; g, perigynium; h, achene.

beside and beyond it, short-stalked. Pistillate spikes 1–4, approximate to remote, loosely relatively few-flowered, subglobose to short-cylindric, 1–2.5 cm long, upper sessile, lower with slender stalks of variable length. Pistillate scales ovate to oblong, to about ⅓ as long as the perigynia, with a medial green, triangular, nerved portion, the sides broadly hyaline, apically acute to obtuse. Perigynia glabrous ovate to lance-ovate, usually somewhat asymmetrical, ribbed, somewhat inflated, tapering gradually from the broadest portion above the base into the beak, 7–10 mm long overall, from the axis disposed at right angles or only moderately ascending. Achene elliptic to narrowly obovate in outline, 3-angled, the angles sometimes somewhat thickened-rounded centrally, faces shallowly concave, surface somewhat granular, dull buffish to brown, about 3 mm long, the style jointed above the base, disarticulating and leaving a beak about 1 mm long at the summit of the achene.

Marshy shores, bogs, depressions in pine savannas and flatwoods, cypress-gum ponds. Coastal plain, N.C. to Fla. Panhandle, w. to La.

32. Carex walteriana Bailey. Fig. 259

Plant with slender, elongate, scaly rhizomes, commonly forming extensive almost pure stands. Stems 4–12 dm tall, relatively slender. Principal leaf blades 2–5 mm wide, the sheaths basally somewhat spongy, blades stiff, margins sharply scabrid. Staminate spikes 1–3, buff to purplish, approximate to remote, the stalk bearing them from below the pistillate spike, extending very much beyond it and usually naked to well above it. Pistillate spike usually solitary, sometimes 2, usually sessile, stiffly erect, oblong in outline, 2–4 cm long. Pistillate scales oblong to ovate, nerved, scarious, apically acute to cuspidate, the lower about as long as the perigynia, the upper ½ as long or a little more. Perigynia strongly ascending on the axis, ovate, nerved, often some nerves impressed, thickish, short-pubescent to glabrous, usually gradually tapering from the broadest portion to a short beak, sometimes abruptly narrowed into the beak, beak shallowly bidentate at the orifice, 4–6 mm long overall. Achene rather closely enveloped, 3-angled, widest at the middle, the angles somewhat knobbed centrally, the faces concave, smooth, olivaceous, body 2–3 mm long, nearly as broad, style jointed somewhat above the base, disarticulating leaving a short beak at the summit of the achene.

Usually in shallow water (except during drought periods), cypress-gum ponds and depressions, evergreen shrub-tree bays and bogs. Coastal plain, s.e. Mass. to n. Fla.

33. Carex granularis Muhl. ex Schk. in Willd. Fig. 260

Tufted, the bases soft to moderately hard. Stems 2–8 dm tall. Principal leaf blades 5–12 mm wide, shorter than to surpassing the flowering stems. Staminate spike solitary, relatively short-stalked, sometimes sessile, ascending beside and beyond the uppermost pistillate spike. Pistillate spikes 2–4, the upper 2 sometimes close, the others distant, narrowly short-cylindric, 1–2 cm long, the uppermost subsessile or short-stalked, all usually erect or ascending. Pistillate scales ovate, a little more than half as long as the perigynia, apically acuminate to short-aristate. Perigynia loosely to compactly disposed, 2.5–4.0 mm long, elliptic to obovate in outline, somewhat inflated, essentially 3-angled but often variously misshapen from being pressed against each other in development, many-nerved, the empty base narrowed and shrunken in drying, apically abruptly contracted to a short, straight or bent beak, entire or barely emarginate at the orifice. Achene obovate in outline, strongly 3-angled, short-stipitate, short-apiculate at the summit, body nearly as broad as long to a little longer than broad, surface olivaceous to brown, dull.

Floodplain and low, moist to wet woodlands, wet clearings, marshy shores and ditches, wet meadows, frequently in calcareous soils. Que. and Maine to Sask., generally southward to n. Fla., Okla. and e. and n.e. Tex.

34. Carex microdonta Torr. & Hook.

Plant with slender scaly rhizomes, single stems or small tufts arising from the rhizomes.

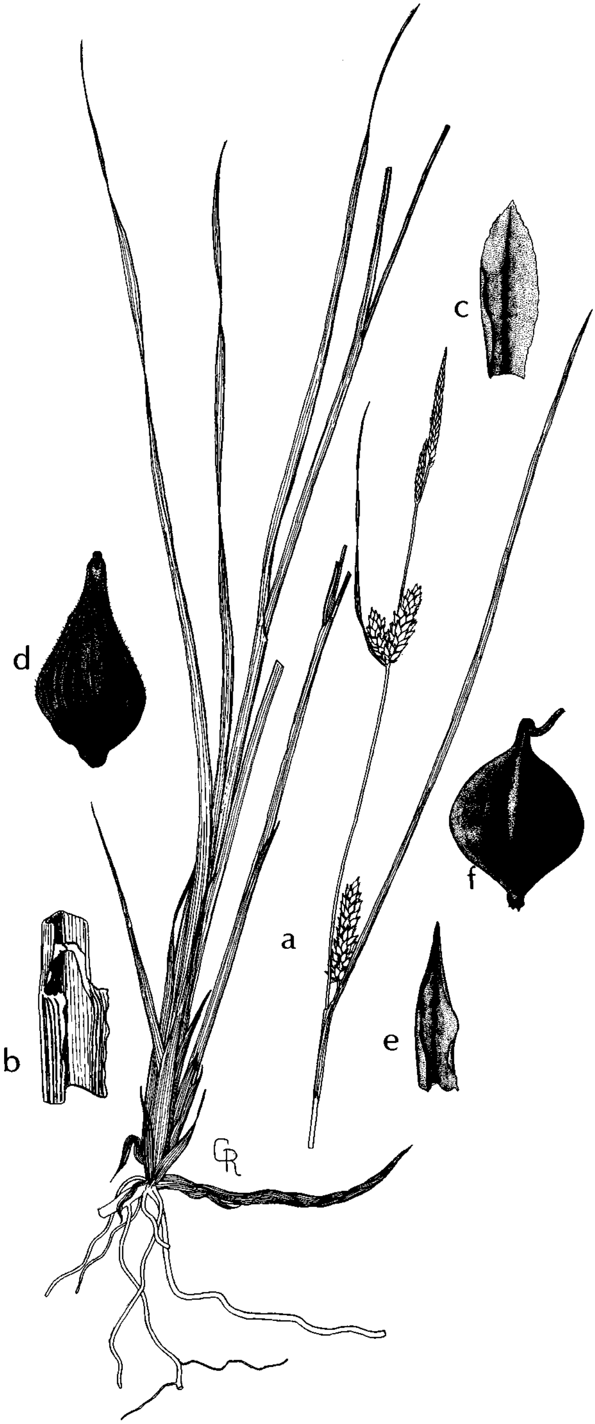

Fig. 259. **Carex walteriana:** a, habit; b, ligule; c, pistillate scale; d, perigynium; e, staminate scale; f, achene.

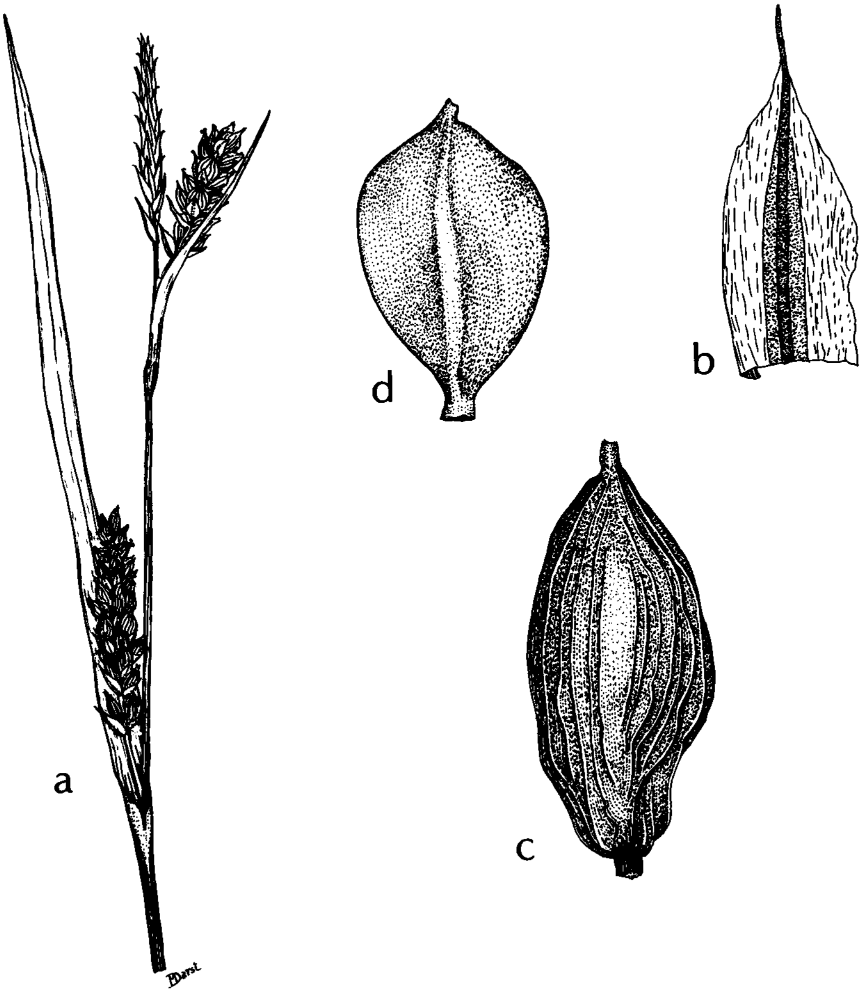

Fig. 260. **Carex granularis:** a, inflorescence; b, scale; c, perigynium; d, achene.

Stems 1–5 dm tall, basal sheaths brown. Principal leaf blades 2–5 mm wide. Spikes 2–5, uppermost 1–2 mostly staminate, close-set, sometimes with a few pistillate flowers basally; other spikes well separated, short-stalked, erect, mostly pistillate but occasionally with a few staminate flowers terminally, 1–5 cm long, 5–6 mm thick. Pistillate scales ovate, acuminate apically, mostly about ⅔ as long as the perigynia, sometimes as long, the green median relatively broad, 3-nerved, sides hyaline to scarious, sometimes rusty brown. Perigynia ovate, 2.5–3.5 mm long (including beak), 2-ribbed, nerved between the ribs, base rounded to short-tapered, abruptly tapered above into a short beak, this shortly bifid at the orifice. Achene obovate in outline, 3-angled, faces somewhat concave or flat, substipitate basally, bent-apiculate apically, about 2.5 mm long overall, surface dull, finely granular.

Open wet depressions and seepage areas, often on calcareous or granitic rocks, ledges, prairie depressions, less frequently depressions of pine flatwoods. Ala. to Tex., Okla., Ark., Mo.

35. **Carex crawei** Dewey.

In general aspect closely similar to *C. microdonta.* Pistillate scales ovate, apically acute, acuminate or short-cuspidate, about ½ as long as the perigynia. Perigynia obtuse apically, abruptly tapering into a short, straight beak, the orifice entire.

Shores, meadows, glades, wet thin soil underlain by rock, mostly in calcareous regions. Que. to Alta., (Wash.?), southward to N.J., Tenn., n. Ala., Okla., Utah.

36. **Carex glaucescens** Ell. Fig. 261

Plant cespitose, glaucous and grayish-green, with short blackish rhizomes. Stems relatively stout, 6–12 dm tall. Principal leaf blades 3–10 mm wide, somewhat glaucous, basal sheaths brown to purplish brown. Staminate spike solitary, relatively long-stalked, extending beyond the uppermost pistillate spike. Other spikes 3–6, pistillate or sometimes some of them staminate terminally, slender-stalked, the stalks usually progressively longer downward, spikes ascending as they develop, drooping at maturity, cylindric, 2–5 cm long, perigynia close-set. Body of pistillate scales oblong-obovate, retuse or emarginate or rounded at the summit, the green median prolonged into a toothed subulate tip reaching or exceeding the tip of the perigynium, sides of the scale scarious. Perigynia heavily glaucous, walls thickish, inflated and drying shrunken or shriveled, broadly elliptic to obovate in outline, 2-ribbed, faces smooth or faintly and irregularly nerved on the upper portions, obtusely tapered above the broadest portion then abruptly narrowed to a short nonbidentate beak. Achenes 3-angled, obovate in outline, the faces concave, 3–3.5 mm long, style jointed somewhat above the base, disarticulating leaving a short apiculation on the achene, angles pale, faces olivaceous to brown. (*C. verrucosa* var. *glaucescens* (Ell.) Wood)

Cypress-gum ponds and depressions, seasonally wet pine savannas and flatwoods, branch bays, adjacent ditches, swales, often in shallow water. Chiefly coastal plain, e. Md. to cen. pen. Fla., w. to e. and s.e. Tex; cen. Tenn.

37. **Carex verrucosa** Muhl. Fig. 262

Very closely similar to *C. glaucescens.* Perigynia (said to be) more definitely nerved on their upper portions. Achene as broad as long or a little broader. Upper pistillate spikes sessile, lowermost usually short-stalked, all erect.

Habitats as for *C. glaucescens.* Coastal plain, N.C. to s. Fla., w. to La.

38. **Carex joorii** Bailey. Fig. 262

In general aspect closely similar to *C. glaucescens.* Body of pistillate scale not retuse or emarginate at the summit but tapering distally to the base of the subulate tip. Perigynial wall thinnish, 2-ribbed and usually evenly and distinctly nerved between the ribs from the base into the beak. Achene dull brown, 2.2–2.5 mm long, broadest somewhat above the middle, approximately as broad as long, 3-angled, rhombic, the angles centrally

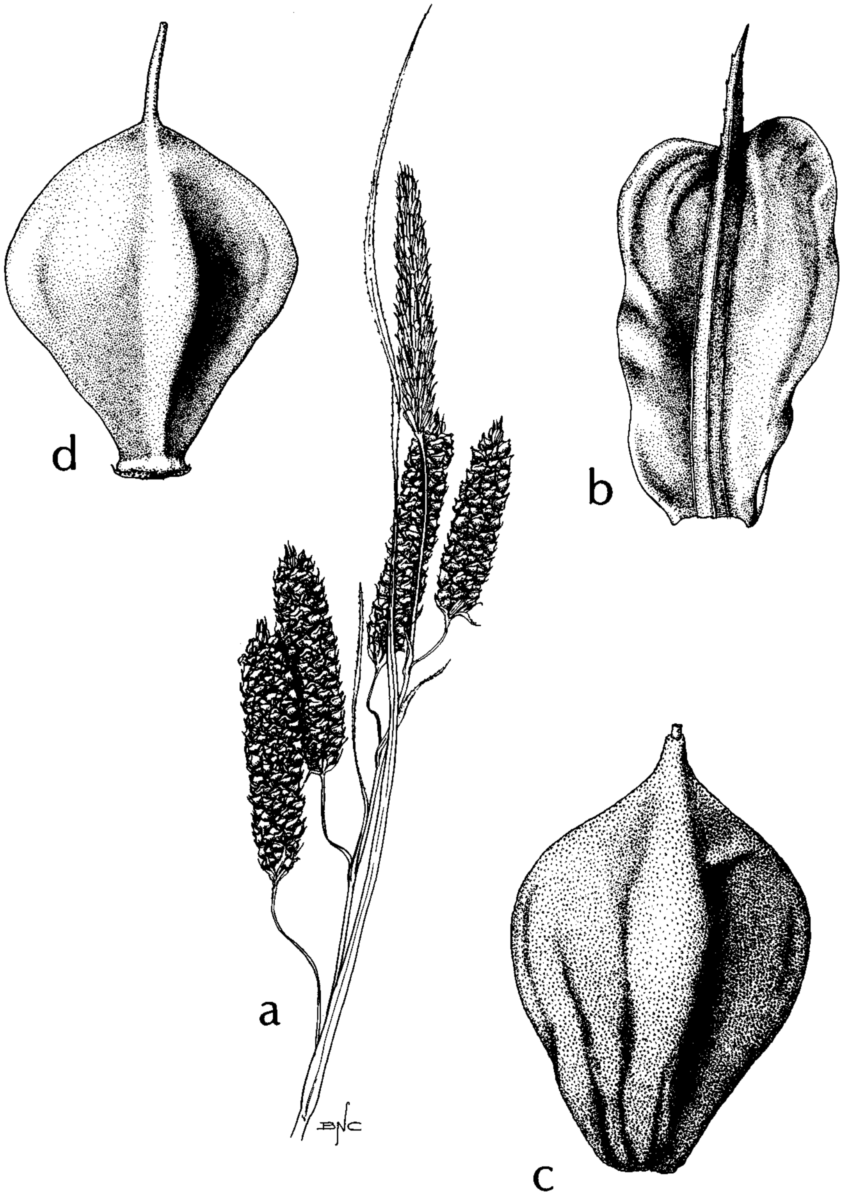

Fig. 261. **Carex glaucescens:** a, inflorescence; b, scale; c, perigynium; d, achene.

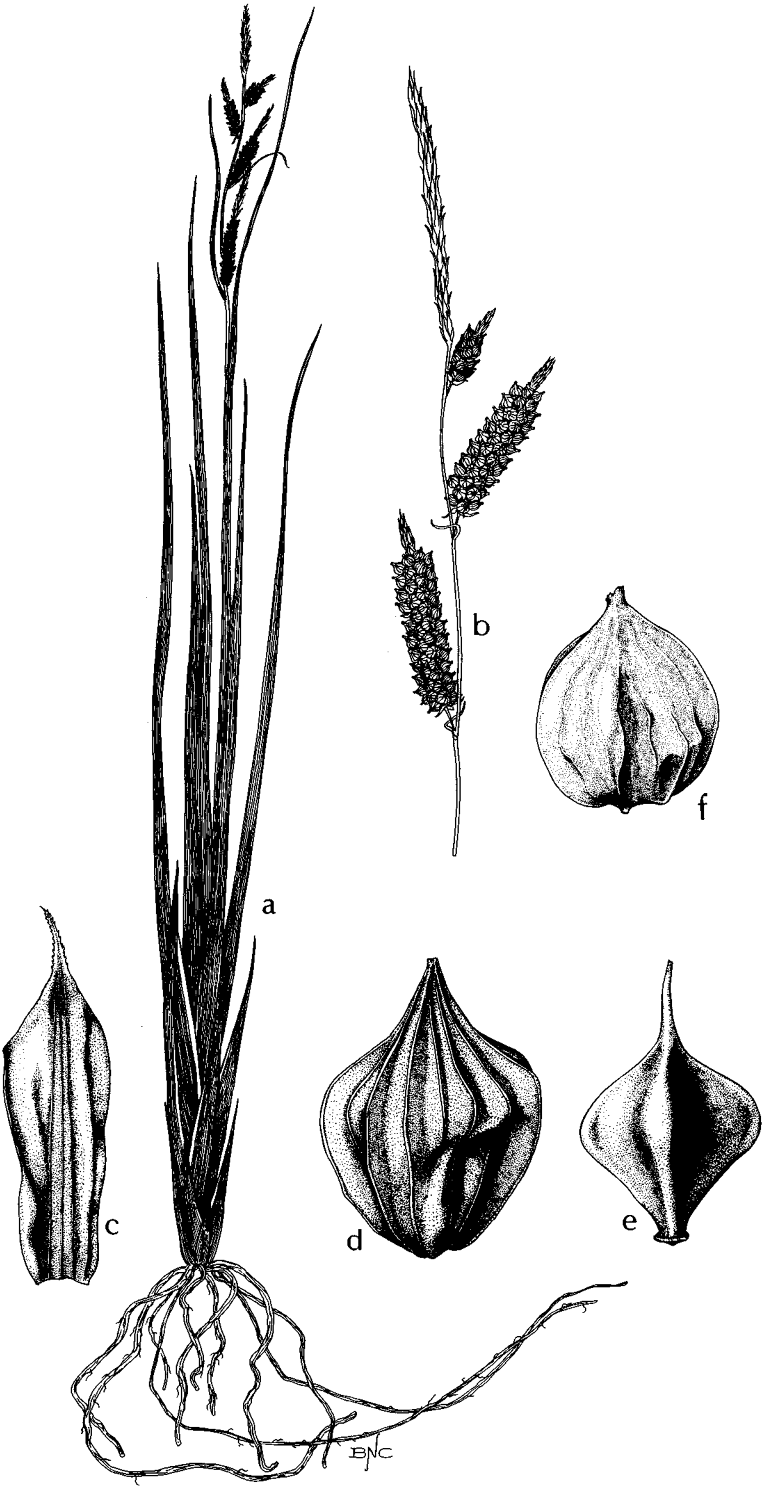

Fig. 262. a–e, **Carex joorii:** a, habit; b, inflorescence; c, scale; d, perigynium; e, achene; f, **Carex verrucosa:** perigynium.

bulged-knobby, the style jointed above the base, disarticulating and leaving a beak nearly 1 mm long at the summit of the achene, basally sometimes substipitate.

Floodplain forests, bottomland woodlands, marshy shores. Coastal plain, outer piedmont, e. Md. to Fla. Panhandle, w. to e. and s.e. Tex., n. in the interior to Okla., Mo., w. Tenn.

39. Carex folliculata L. Fig. 263

Cespitose. Stems 4–8 dm tall. Principal leaf blades 5–15 (–20) mm wide, flexuous, septate, the lower sheaths somewhat spongy, pale. A single terminal staminate spike ascending beside and beyond the uppermost pistillate spike. Pistillate spikes 2–4, mostly erect, the lower sometimes drooping, the uppermost frequently, others rarely, with a small staminate terminal portion, widely spaced on the inflorescence, uppermost usually sessile, those lower with progressively longer, flexuous stalks; perigynia relatively few, rather loosely disposed on the axis, sometimes somewhat ascending, usually spreading nearly at right angles to the axis, short-cylindric to subglobose. Pistillate scales sometimes ovate, acute to acuminate apically, varying to ovate-oblong below and the summit long-tapered, or elongate-triangular, short- to long-awned; medial green portion long-triangular, strongly several nerved, the central nerve sometimes scabrid distally, the sides hyaline-scarious. Perigynia lanceolate, nerved, tapering gradually from the broadest portion into a nearly subulate beak, 8–15 mm long overall, beak with 2 erect or somewhat spreading teeth at the orifice. Achene elliptic to obovate in outline, 3-angled, the angles rounded, faces flat or shallowly concave below, style jointed above the base, disarticulating, leaving the summit of the achene apiculate. (*C. lonchicarpa* Willd.; *C. smalliana* Mack.)

Stream banks, wet woodlands, bogs, glades, swales, low hammocks. Nfld. to Wis., generally southward to n. Fla. and e. Tex.

A somewhat similar plant, much rarer in our range, is *C. collinsiae* Nutt. Its spikes are usually fewer- and looser-flowered, the perigynium narrowly lanceolate, the two teeth at its orifice reflexed. Swamps, bogs. Coastal plain, R.I. to Ga.

40. Carex comosa Boott. Fig. 264

Densely cespitose, relatively coarse. Stems 6–15 dm tall. Principal leaf blades 6–16 mm wide, sheaths buff to brown, spongy, sheaths and lower portions of blades septate. Staminate spike solitary, sessile or short-stalked, ascending beside the uppermost pistillate spike, usually little if any exceeding it but sometimes considerably exceeding it, occasionally pistillate terminally. Pistillate spikes 3–6, cylindric, mostly approximate, the upper short-stalked or sessile, erect or ascending, the lower slenderly long-stalked, drooping or widely spreading. Body of pistillate scales nearly oblong, with a narrow green median and whitish hyaline sides, the median extending beyond the body as a rough subulate awn, the scale shorter than the perigynium. Perigynia 5–7 mm long overall, lanceolate or lance-ovate, rather rigid, strongly nerved, abruptly narrowed below into a stipelike base, gradually narrowed from the widest portion into a short beak whose summit bears relatively long spreading subulate teeth, one either side of the orifice, the beaks taken together imparting a very bristly appearance to the spike. Achene 3-angled, obovate to elliptic in outline, 1.5–1.8 mm long, buff-brown, the persistent style straight.

Commonly in shallow water, marshes, marshy shores, swamps, wet meadows, wet clearings. S.e. Canada to Minn., generally southward to cen. pen. Fla., and e. Tex.; Wash., Oreg., Idaho, Calif.

41. Carex frankii Kunth. Fig. 265

Rhizomatous, forming loose clumps. Stems 3–8 dm tall, commonly 3–4. Principal leaves 4–10 mm wide, the upper and bracteal leaves much exceeding the inflorescence. Staminate spike solitary, stalked, extending well beyond the pistillate spikes, sometimes absent or very inconspicuous. Pistillate spikes 2–6, mostly 3–4, erect, overlapping or the

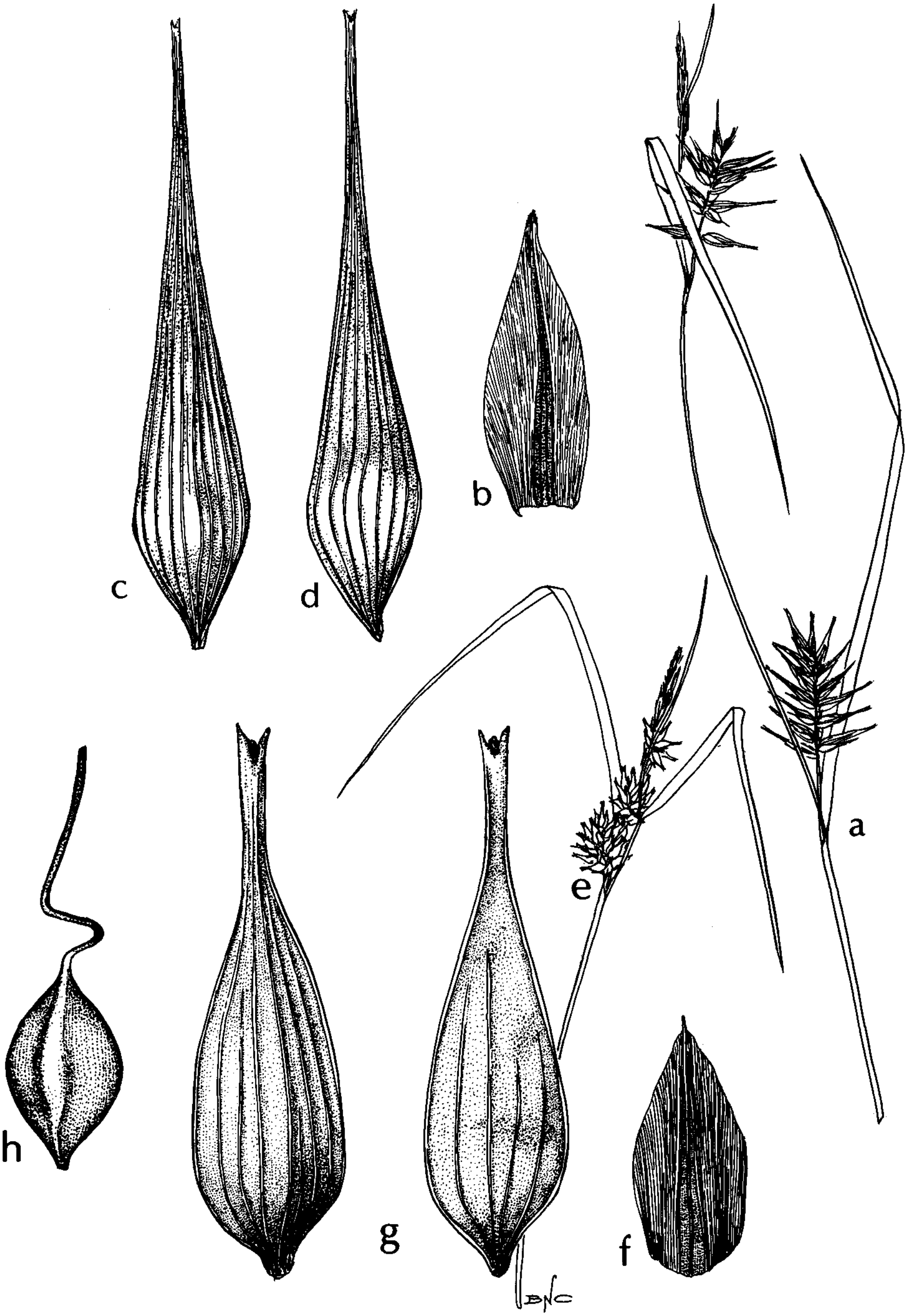

Fig. 263. a–d, **Carex folliculata:** a, inflorescence; b, scale; c–d, perigynium (two views); e–h, **Carex elliottii:** e, inflorescence; f, scale; g, perigynium (two views); h, achene.

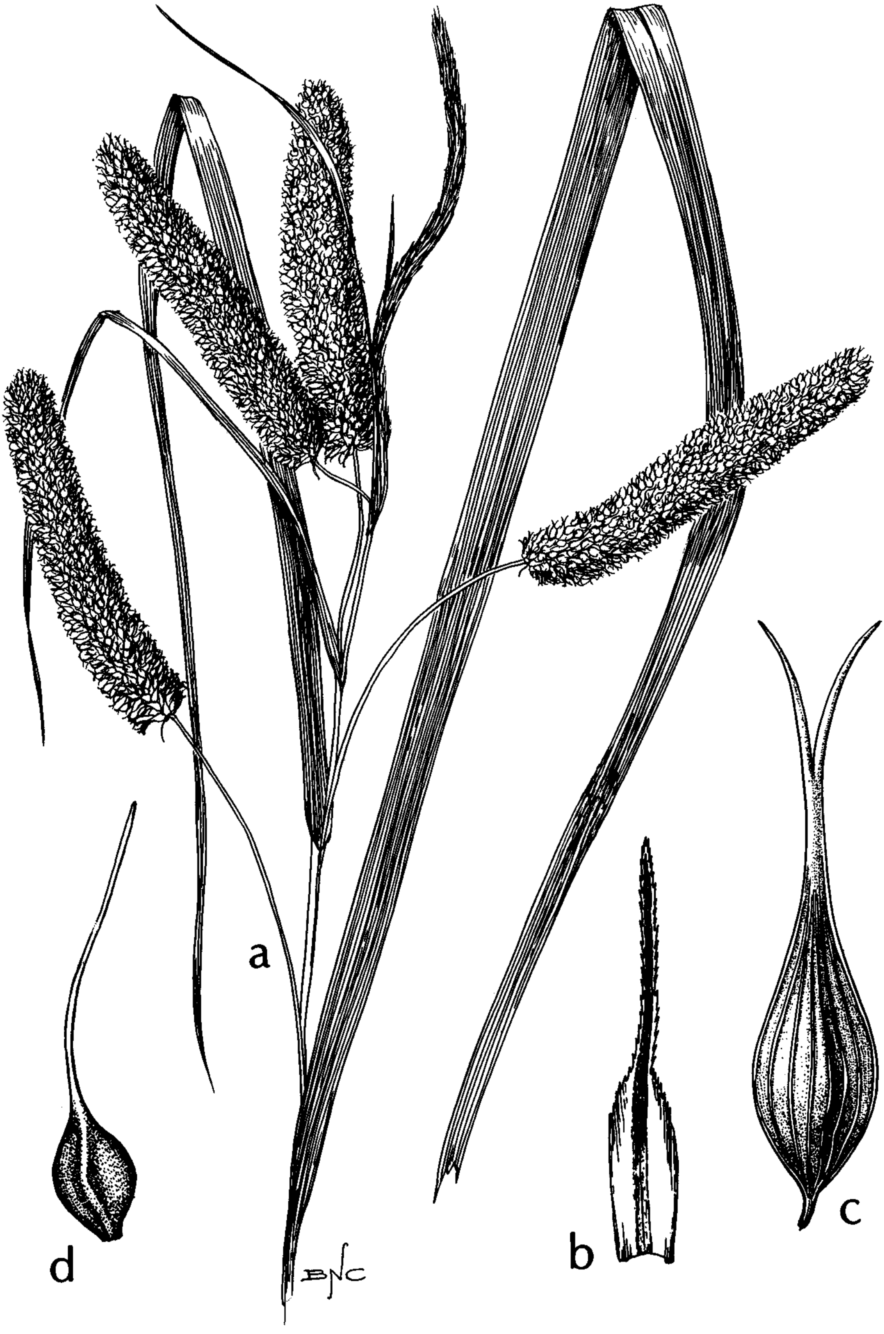

Fig. 264. **Carex comosa:** a, inflorescence; b, scale; c, perigynium; d, achene.

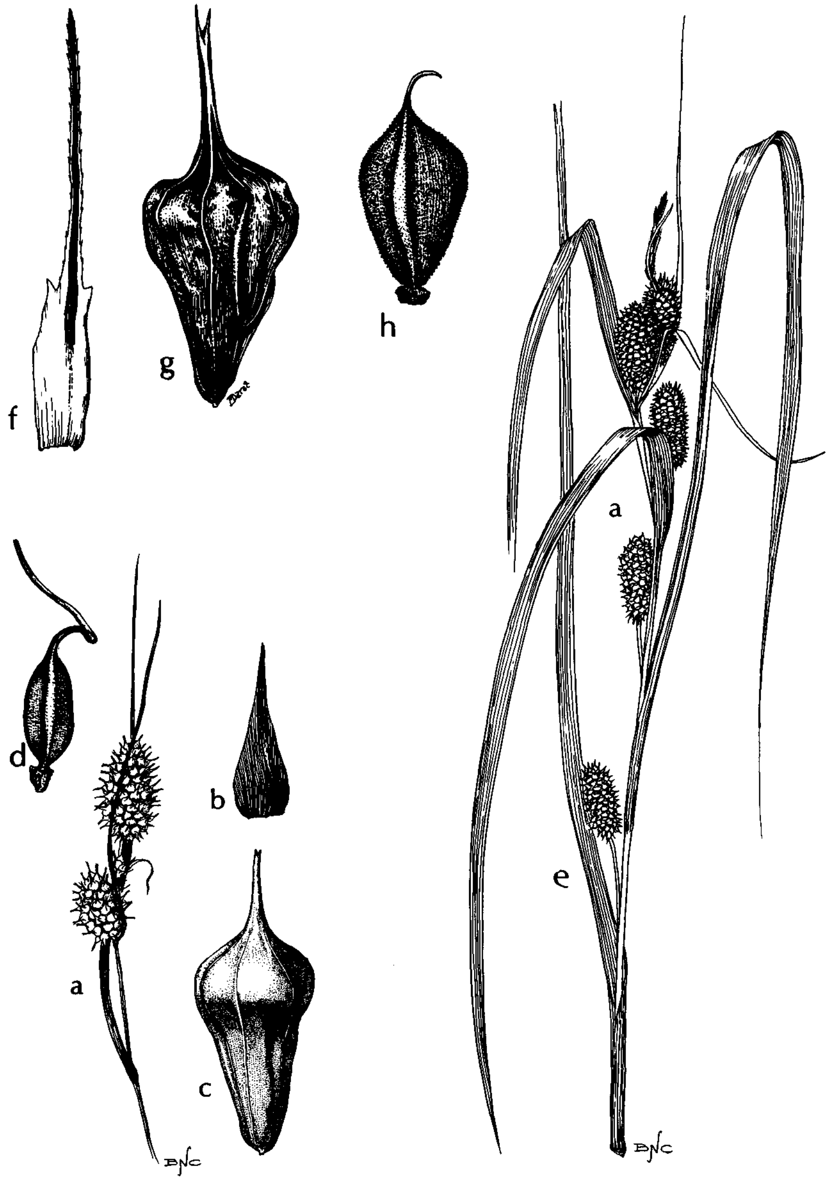

Fig. 265. a–d, **Carex squarrosa:** a, inflorescence; b, scale; c, perigynium; d, achene; e–h, **Carex frankii:** e, inflorescence; f, scale; g, perigynium; h, achene.

lower remote, oblong-cylindrical to -elliptical, 1–3 (–4) cm long, about 1 cm wide, body of pistillate scale oblong, about 2 mm long, hyaline except for a narrow green median which begins near the middle and extends beyond the body as a subulate awn 2–3 mm long or a little more, usually longer than the perigynia and giving the spike a bristly appearance. Perigynia obconic-obovate, ribbed, drying wrinkled and misshapen, the summit inflated and essentially truncate, abruptly contracted into a subulate beak, beak bidentate at the orifice, perigynium 5–6 mm long overall. Achene loosely enveloped, dull brown, 3-angled, obovate, body 1.5–2.0 mm long, surficially finely papillose, style persistent, usually curved.

Floodplain forests, wet woodlands, marshy-boggy shores, mucky areas about springs. N.Y. to Ill. and Kans., generally southward to Fla. Panhandle and Tex.

42. Carex squarrosa L. Fig. 265

Cespitose. Stems 3–8 dm tall. Principal leaves 3–6 mm wide, at least the bracteal leaves much exceeding the inflorescence. Spike erect, with a narrowly turbinate, staminate basal portion then abruptly broadened to the oblong to subglobose pistillate portion, the latter 10–30 mm long, 15–20 mm broad, usually a single terminal spike, sometimes 1 or 2 usually wholly pistillate smaller spikes below. Pistillate scales herbaceous medially, hyaline on the sides, ovate to elliptic-oblong, apices acuminate or short-awned, about as long as the body of the perigynium and not exserted from between the perigynia. Body of perigynium obconic-obovate, drying wrinkled, broadest near the inflated summit and abruptly contracted into the slender subulate beak 3 mm long, beak shortly bidentate at the orifice; beaks collectively giving a markedly bristly appearance to the spike. Achene loosely enveloped, 3 mm long, 3-angled, narrowly elliptic in outline, much longer than broad, the elongate persistent style strongly bent below the middle.

Swamps, marshes, marshy shores, meadows. Que. and Conn. to s. Ont., Minn. and Nebr., generally southward to Ga., Okla. and Ark.

43. Carex typhina Michx.

Similar to *C. squarrosa* in general habital features. Pistillate scales elliptic, their apices short-acute or obtuse. Beak of perigynium 2 mm long. Achene broadly elliptic in outline, ½ as broad as long or a little more, the style straight.

Floodplain forests, wet woodlands, meadows. W. Que., s.w. Maine, Mass., Conn. to Wis., generally southward to the Fla. Panhandle and e. Tex.

44. Carex hyalinolepsis Steud. Fig. 266

Plant with elongate scaly rhizomes. Similar in general aspect to *C. walteriana* of acid swamps though coarser. Stems 1–2 from the rhizome, 4–8 dm high, to about 1 cm wide basally (including the sheaths). Principal leaf blades 8–15 mm wide, stiff, septate, evidence of the septae visible on the lower surface. Staminate spikes 2–6, approximate or overlapping, the axis bearing them from below the uppermost pistillate spike and extending well beyond it, brown to purplish. Pistillate spikes 1–3, sessile, or the lower short-stalked, sometimes drooping, usually erect, short- to long-oblong in outline, 2.5–5 cm long. Lower pistillate scales lanceolate, only a little narrowed below the middle, strongly tapering above, apically subulate to awned, about as long as the perigynia, the upper scales ovate, short-awned apically, a little more than half as long as the perigynia; medially green, the sides scarious. Perigynia narrowly ovate to nearly oblong, gradually tapering to a short beak, weakly nerved below, sometimes not at all nerved toward the summit, 5–8 mm long overall, bidentate at the orifice. Achene rather closely enveloped, 3-angled except at the summit, the angles somewhat rounded, faces concave, obovate in outline, 2–2.5 mm long, the persistent style straight or somewhat bent at the base. (*C. lacustris* Willd. var. *laxiflora* Dewey)

Nonacid marshes, floodplain forests, swales, shores, ditches. Mostly coastal plain from s. N.J. to Fla. Panhandle, thence to Tex., n. in the interior to s. Ont., s. Mich., s. Wis., Iowa, Nebr., Okla.

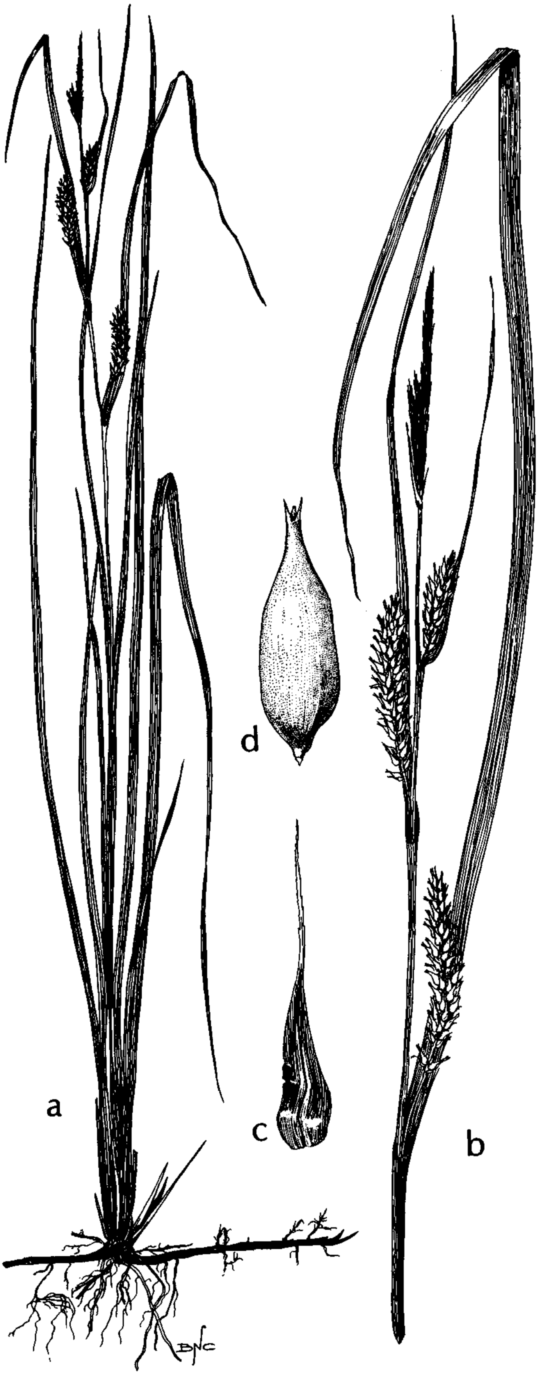

Fig. 266. **Carex hyalinolepis:** a, habit; b, inflorescence; c, scale; d, perigynium.

45. Carex lurida Wahl. Fig. 267

Cespitose, the clumps usually large and dense. Stems 3–10 dm tall. Basal sheaths purplish red, sometimes brown. Principal leaves mostly 4–7 mm wide. Staminate spike solitary, short- to long-stalked, its stalk from below the uppermost pistillate spike and ascending beside it, as long as or longer than that spike. Pistillate spikes mostly 2–3, sometimes 1 or 4, oblong, 2–4 (–6) cm long, 1.5–2.0 cm broad, sessile or nearly so, ascending, the lower stalked and drooping, densely flowered. Pistillate scales narrowly oblong basally, green medially, the sides hyaline, the green median extended as a long subulate awnlike tip, in length overall from about as long as the body of the perigynium to about as long as the beak. Body of the perigynium obovate to ovate in outline, inflated, 4–6 mm long, gradually tapered into the 3–4 mm long subulate beak. Achene loosely enveloped, 2–2.5 mm long, elliptic to obovate in outline, 3-angled, one face flat or nearly so, the other two rounded, brown, the surface finely granular-reticulate, the long slender style strongly bent below the middle.

Commonly in shallow water, wet woodlands, swamps, floodplain forests, open bogs, marshy shores, ditches and drainage canals, wet meadows. N.S. to Minn., generally southward to Fla. and Tex.; e. Mex.

Note: *Carex baileyi* Britt., a plant very much more restricted in distribution in our range, is similar to *C. lurida* in general aspect but much more slender throughout. Leaves 2–4 mm wide. Pistillate spikes mostly 2–3 mm wide. Body of the perigynium 2–2.5 mm long, the beak as long or a little longer. Body of the achene 1.5–2.0 mm long, 3-angled, the faces about equal, the style usually doubly bent or completely looped below.

Bogs, springy areas in woodland, meadows. S.w. Que. and N.H. to Mich., s. in the mts. to Tenn. and N.C.

46. Carex elliottii Schw. & Torr. Fig. 263

Slenderly rhizomatous and loosely cespitose. Stem slender, 2.5–9 dm tall, reddish-purple basally. Principal leaves 1.5–5 mm wide, shorter than the stems. Staminate spike solitary, terminal, short- to long-stalked. Pistillate spikes 2–3, approximate or distant, sessile or short-stalked, ascending, short-oblong to subglobose, relatively loosely few-flowered. Pistillate scales broadly ovate, upper acuminate or mucronate apically, green medially, scarious on the sides. Body of perigynium about 5 mm long, ovate to lance-ovate, usually asymmetric, strongly nerved, gradually narrowed into the 2–3 mm long beak which is bidentate at the orifice. Achene loosely enveloped, 3-angled, obovoid in outline, body 2–3 mm long, style somewhat longer, persistent, contorted below the middle, or straight, surface very finely granular, dull olive brown.

Bogs, evergreen hardwood branch bays, swamps, adjacent ditches. Coastal plain, N.C. to cen. pen. Fla. and s. Ala.

47. Carex bullata Schk.

Rhizomatous or stoloniferous, loosely if at all cespitose. Stems slender, 3–10 dm tall, bases purplish red. Leaves elongate, 2–3 mm wide. Staminate spikes 1–3, borne on an elongate terminal axis, sometimes with 1–several pistillate flowers basally, terminally, or both. Pistillate spikes usually 1 or 2, sometimes 3, remote, oblong to subglobose, 1–5 cm long, about 2 cm wide, erect, sessile or stalked, usually compactly flowered. Pistillate scales more or less oblong, acute apically, about half as long as the body of the perigynium. Body of perigynium ovate, strongly nerved, inflated, tapering gradually into the beak, 8–9 mm long overall, widely diverging from the axis. Achene loosely enveloped, obovate in outline, about 2 mm long, style somewhat contorted just above the base. (Apparently frequently infertile.)

Bogs, swales, meadows. N.S. and Maine to e. N.Y., s. to Tenn. and Ga.

48. Carex intumescens Rudge. Fig. 268

Cespitose. Stems 3–8 dm tall. Principal leaves 3–8 mm wide. Staminate spike solitary,

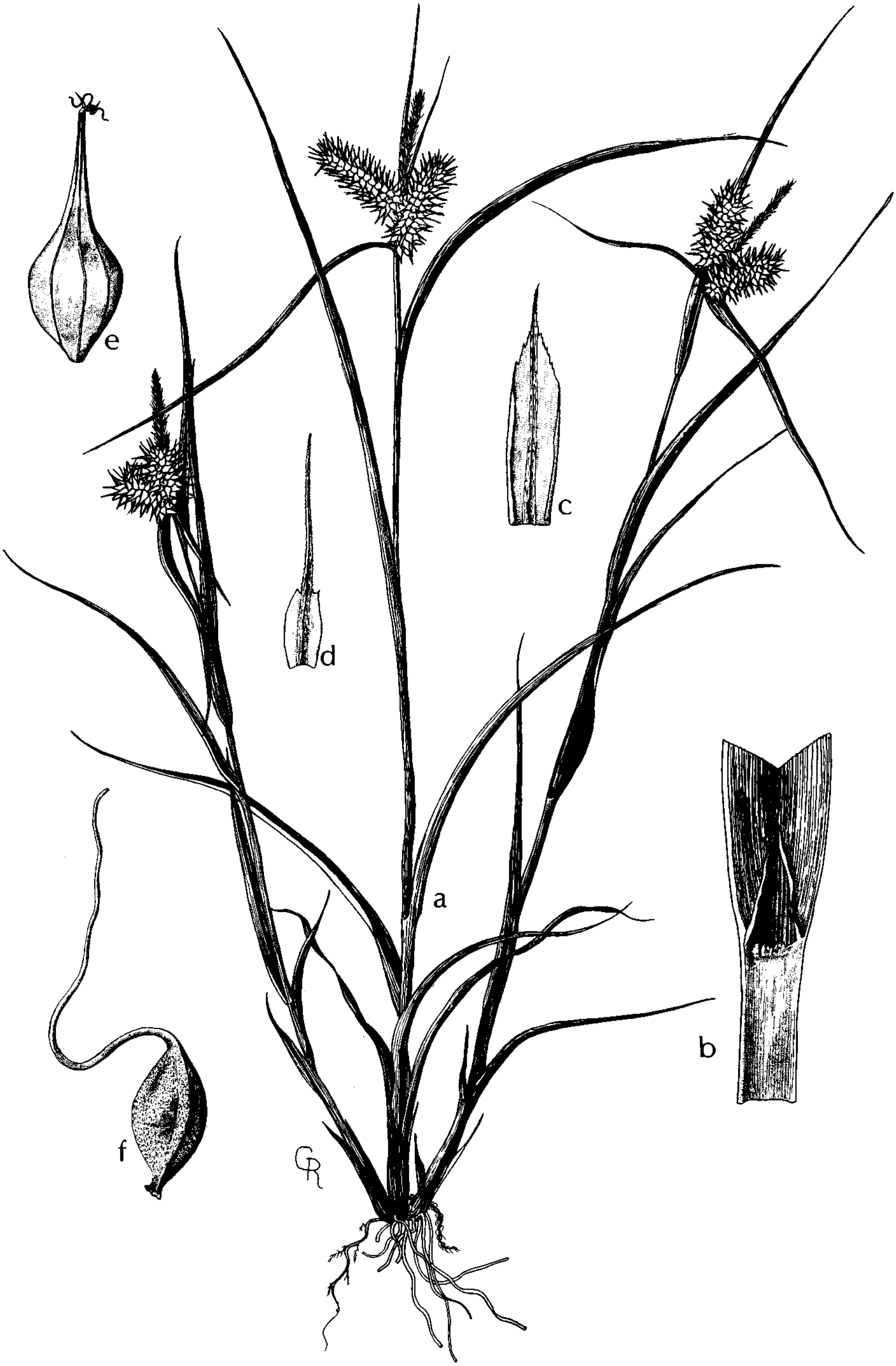

Fig. 267. **Carex lurida:** a, habit; b, ligule; c, staminate scale; d, pistillate scale; e, perigynium; f, achene.

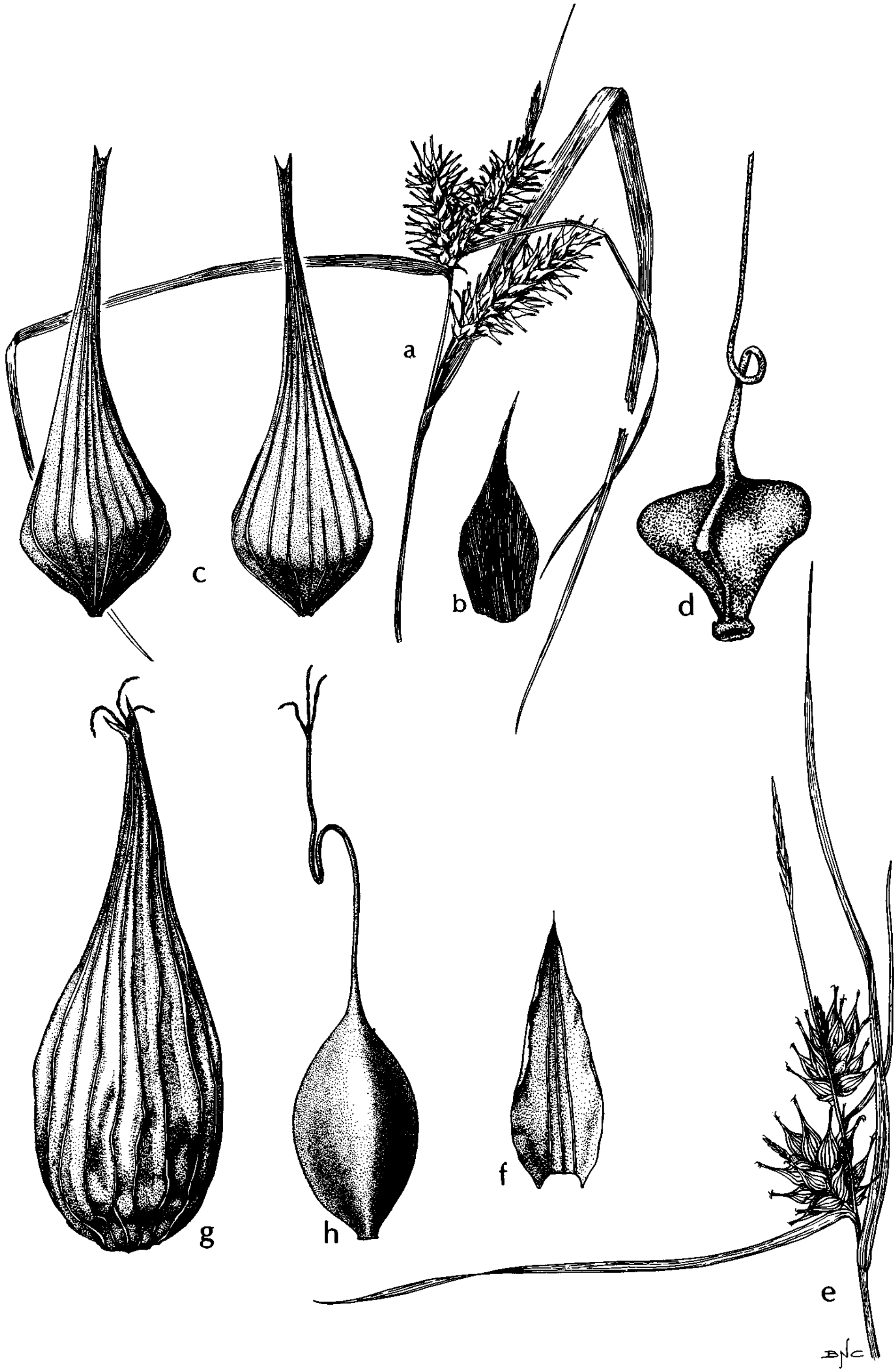

Fig. 268. a–d, **Carex gigantea:** a, inflorescence; b, scale; c, perigynium (two views); d, achene; e–h, **Carex intumescens:** e, inflorescence; f, scale; g, perigynium; h, achene.

sessile or stalked, from below the uppermost pistillate spike and ascending beside or beyond it. Pistillate spikes 1–3, subglobose to globose, 1–2.5 cm long, approximate, relatively few-flowered, loosely disposed. Pistillate scales ovate or lance-ovate, acuminate or mucronate apically, green medially, the sides hyaline, much shorter than the perigynia. Perigynia ovate in outline, inflated, strongly ribbed, glabrous, the base rounded somewhat below the widest portion, gradually tapered above into the beak, the latter strongly bidentate at the orifice, 10–18 mm long overall. Achene loosely enveloped, weakly 3-angled, elliptic in outline, body about 4 mm long, surface smooth, yellowish, the persistent style straight.

Floodplain forests, wet woodlands, sometimes in mesic woodlands, wet clearings. Nfld. to Keewatin, generally southward to cen. pen. Fla. and e. and s.e. Tex.

49. Carex grayii Dewey.

Similar in general aspect to *C. intumescens.* Pistillate spikes on the average somewhat more compact and larger though ranging from 1–4 cm long and wide. Perigynia strongly inflated, broadest above the middle, strongly tapering from the broadest portion to the base, the tapering base and sometimes the entire perigynium pubescent.

Floodplain and wet woodlands. S.w. Que. and Vt. to Wis. and Iowa, generally southward to Ga. and Miss.

50. Carex louisianica Bailey.

Stems solitary or few together, arising from slender, elongate, horizontal rhizomes, thus tending to be clonal, 2–6 dm tall. Principal leaves 3–6 mm wide. Staminate spike solitary, from below the uppermost pistillate spike and ascending beside or beyond it, short- or usually long-stalked. Pistillate scales scarious, lance-ovate below, tapering distally into a narrowly acute, acuminate or subulate tip, shorter than the perigynium. Pistillate spikes 2–4, approximate, sessile or the lower stalked, ascending, from subglobose to oblong in outline, commonly considerably longer than broad, 1–3 cm long or a little more. Perigynia loosely enveloping achene, ovate in outline, strongly ribbed, inflated, relatively thin-walled, rounded at the base, gradually tapering from the broadest portion to a slender beak, mostly 10–12 mm long overall, the slender portion of the beak about half as long as the body, strongly bidentate at the orifice. Body of the achene olive brown, smooth, strongly 3-angled, rhombic, the midpoints of the angled sides blunt-pointed, the faces flat to concave, 2.5–3 mm long, about as broad as long, the persistent style strongly contorted below.

Floodplain forests, moist to wet woodlands and swamps. Chiefly coastal plain, s. N.J. to cen. pen. Fla., w. to Tex., northward in the interior to Ky., Ind., Mo.

51. Carex lupulina Muhl. ex Schk. in Willd. Fig. 269

Cespitose from short rhizomes, relatively coarse. Stems 4–14 dm tall, lower sheaths reddish purple. Principal leaf blades 5–12 mm wide, septate, evidence of the septae on the lower surface. Staminate spike solitary, stalked, the stalk arising below the uppermost pistillate spike, ascending beside it and usually somewhat beyond it. Pistillate spikes 2–6, the upper sessile, the lower short- to long-stalked, approximate or distant, short- to relatively long-oblong in outline, sometimes subglobose, mostly 3–6 cm long, about 2 cm wide. Pistillate scales with a nearly oblong body, green and nerved medially, hyaline on the sides to about the base of the long-acute to subulate tip, about as long as the body of the perigynium. Perigynia compacted, strongly ascending, ovate, ribbed, inflated, somewhat tapering below, gradually tapering from the broadest portion into a beak as long as or longer than the body, often somewhat asymmetrical, 12–20 mm long overall, beak strongly bidentate at the orifice. Achene loosely enveloped, 3-angled, rhombic, the angles centrally somewhat rounded-knobbed, faces mostly concave, body about ⅔ as wide as long to nearly as wide as long, about 4 mm long, broadest just above the middle, narrowed below to a short stipelike base, persistent style looped below the middle. (Incl. *C. lupuliformis* Sartw. ex Dewey)

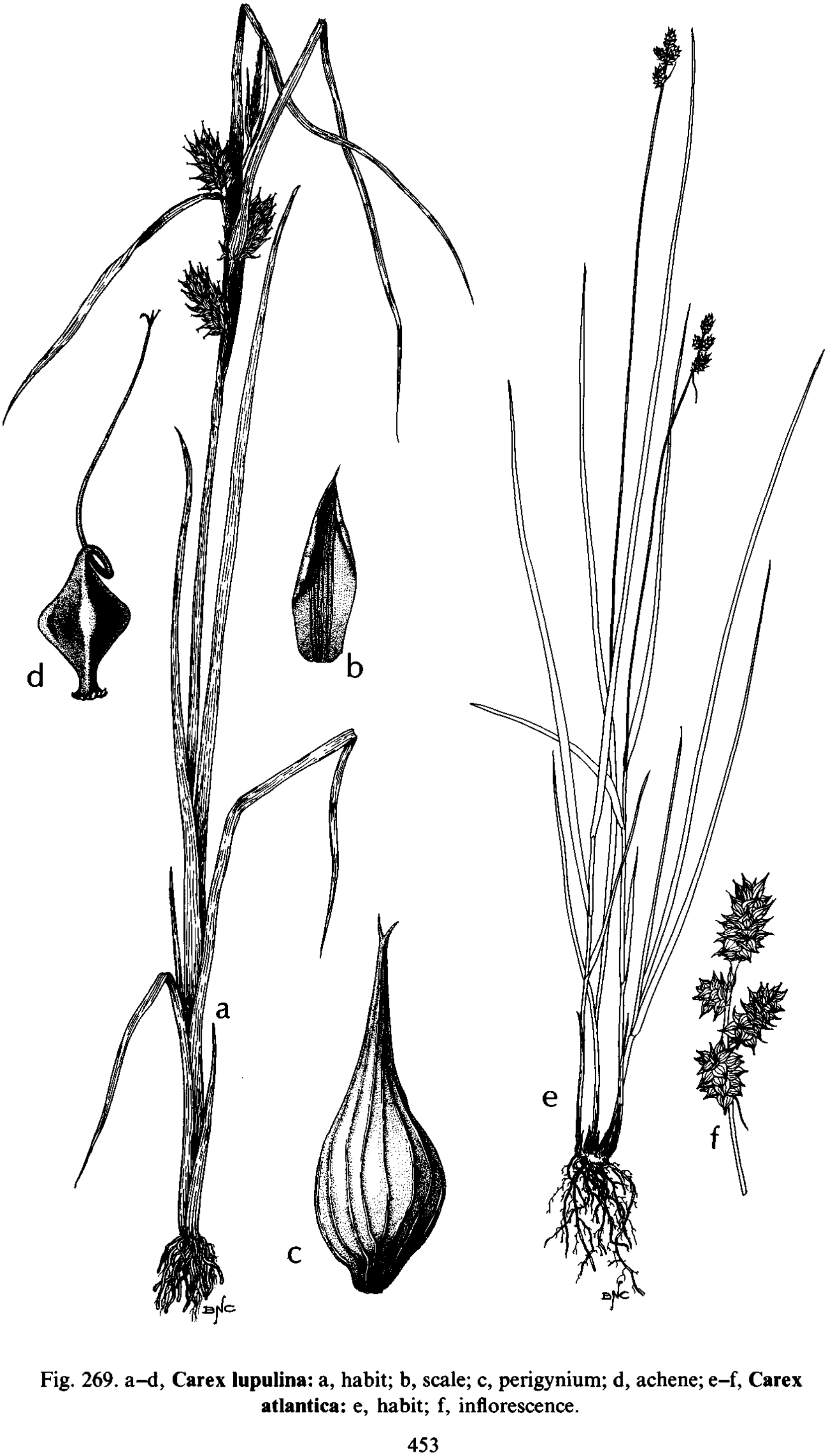

Fig. 269. a–d, **Carex lupulina:** a, habit; b, scale; c, perigynium; d, achene; e–f, **Carex atlantica:** e, habit; f, inflorescence.

In wet woodlands, wet clearings, swamps, marshy shores, ditches and sloughs, swales. N.S. to Minn., generally southward to cen. pen. Fla., and e. and s.e. Tex.

52. Carex gigantea Rudge. Fig. 268

In general aspect similar to *C. lupulina* but sometimes with several elongate, slender, arching-ascending scaly rhizomes and loosely cespitose. Perigynia diverging from the axis of the spike at right angles or very nearly so; body of the perigynium short and broadly ovate, very little tapered basally, or nearly truncate, gradually tapered above into a beak 2–4 times as long as the body. Achene rhombic, conspicuously broader than long, the angles centrally widely diverging and knob-tipped, the faces strongly concave, persistent style bent or contorted below the middle.

Cypress ponds or depressions, floodplain forests, swamps, wet woodlands, marshy shores. Chiefly coastal plain, Del. to s. Fla., w. to e. and s.e. Tex., northward in the interior, Okla. to Ind.

Palmae (PALM FAMILY)

1. Petioles armed with sharp recurved spines. 1. *Serenoa*
1. Petioles not armed with spines, smooth.
  2. Leaf blades and petioles green and glabrous beneath; leaf sheaths without spines. 2. *Sabal*
  2. Leaf blades (below) and petioles more or less silvery pubescent; leaf sheaths with long needlelike spines. 3. *Rhapidophyllum*

1. Serenoa

Serenoa repens (Bartr.) Small. SAW PALMETTO.

Stem commonly horizontal and mostly underground, sometimes with an aerial portion erect or leaning, to several m tall, often branched, especially below ground. Petioles armed with sharp recurved spines; leaf blades fanlike, without a midrib, suborbicular in outline, green, or markedly glaucous (chiefly along the east coast of Florida and in the Florida scrub), cordate at the base, to about 8 dm broad.

Seasonally wet to dryish pine flatwoods, longleaf pine-deciduous scrub oak sand ridges, sand pine-oak scrub, coastal dunes. Coastal plain, S.C. to Fla., w. to e. La.

2. Sabal

- Leaf blades without a midrib except at the very base. 1. *S. minor*
- Leaf blades with a prominent midrib curving downward distally. 2. *S. palmetto*

1. **Sabal minor** (Jacq.) Pers. DWARF PALMETTO, BLUESTEM.

Stem usually very short, little above ground level, occasionally (in La. and Tex.) with stems to 8 m tall. Petiole smooth; leaf blades fanlike, suborbicular in outline, without a midrib, green, to 15 dm wide, distally divided for up to ⅔ their length into segments, these cleft apically, entire on the margins, or more rarely with filiferous threads. (Incl. *S. louisiana* (Darby) Bomhard)

Floodplain forests, commonly where flooded seasonally, swamps, rarely in upland woodlands. Coastal plain, N.C. to Fla., w. to s.w. Ark. and Tex.

2. **Sabal palmetto** (Walt.) Lodd. ex Schult. & Schult. CABBAGE PALMETTO.

Tree with a single stem to 20 m tall. Petioles smooth; leaf blades fanlike but with prominent midribs downwardly curved distally, to 1 m long and wide or more, sometimes wider than long, green, divided distally into segments with filiferous threads marginally.

Swamps, wooded islands in marshes, wet mixed hammocks, river banks, seasonally wet prairies, maritime forests. Coastal plain, s.e. N.C. to s. Fla. and Fla. Panhandle.

3. Rhapidophyllum

Rhapidophyllum hystrix (Pursh) Wendl. and Drude. NEEDLE PALM.

Shrub with erect, leaning, or reclining stem to about 1.5 m tall. Petioles without spines or teeth, the leaf sheaths bearing long, needlelike, stiff and very sharp spines. Leaf blades fanlike, without a midrib, dark green above, the lower surface and petioles scurfy-pubescent; blades truncate basally, mostly 5–8 dm broad.

Wooded river bluffs and ravine slopes, calcareous rocky woodlands, moist to wet floodplains of small woodland streams, springy seepage areas in ravines and bayheads. Coastal plain, Ga. to cen. pen. Fla., Ala.

Araceae (ARUM FAMILY)

1. Plants floating rosettes of gray-green, velvety leaves on short stems, perennating by stolons. 1. *Pistia*
1. Plants rooted in the substrate, even when in water.
  2. Leaves sessile, narrow and swordlike or irislike, the spadix lateral on a leaflike axis. 2. *Acorus*
  2. Leaves petioled, broad, the spadix seated within a spathe or terminal.
    3. Leaves compound. 3. *Arisaema*
    3. Leaves simple.
      4. Leaf blades broadly oblong-elliptic; spathe obscure, forming a sheath at base of a long scape terminated by a golden-yellow spadix. 4. *Orontium*
      4. Leaf blades broadly ovate, sagittate or hastate; spadix seated within a conspicuous spathe.
        5. Leaves peltate. 5. *Colocasia*
        5. Leaves not peltate.
          6. The leaves ovate or ovate-cordate, short-petioled. 6. *Symplocarpus*
          6. The leaves with sagittate or hastate bases, long-petioled.
            7. Plant without corms or rhizomes; leaf blades glaucous beneath, the larger ones not exceeding about 5 dm long, 2.5 dm wide; petioles to about 6 dm long. 7. *Peltandra*
            7. Plant with a cormose base, extending by rhizomes from the corms; leaf blades not glaucous beneath, the larger ones to 9 dm long or more, as wide across the base at the level of junction of blade and petiole; petioles very stout, the longer ones 18–20 dm long. 8. *Xanthosma*

1. Pistia

Pistia stratiotes L. WATER-LETTUCE. Fig. 270

Floating stoloniferous herb with a rosette of gray-green leaves and numerous roots. Leaves sessile, blades simple, ovate to obovate-cuneate, densely pubescent, 3–15 cm long. Spathe 2–4 cm long, tubular at base, free and spreading above, slightly constricted above the middle. Plants monoecious, both male and female flowers on the spadix. Flowers without a perianth, pistillate solitary below, staminate whorled above at the summit of the spadix, subtended by a membranous collar around the free portion of the spadix, this in turn subtended by a short-stalked cordate, membranous flap. Ovary 1-loculed, ovules numerous. Fruit green, ovoid to ellipsoid, many-seeded, crowned by the persistent style. Seed with a rugose, thick testa.

Commonly weedy, forming dense mats and clogging waterways. In Florida seeds are apparently not produced, possibly because of the absence of pollinating agents. Peninsular Fla. from the lower Suwannee River southward; locally westward to Tex.; pantropical.

2. Acorus

Acorus calamus L. SWEETFLAG.

Herbaceous perennial with a thick rhizome and sessile sword-shaped leaves. Leaves 0.5–1.0 m or more long, 0.7–2.5 cm wide. Spadix borne laterally on a leaf-like axis, 4–9 cm long. Spathe absent (the extension of the fertile axis beyond the spadix often interpreted as an open spathe). Flowers bisexual, 3-parted, greenish. Perianth of 2 whorls of 3 concave segments. Stamens 6. Ovary 2–3-locular. Fruit a gelatinous, few-seeded berry.

Meadows, marshes, swamps, often in shallow water. N.S., P.E.I., and Que. to Mont. and Oreg., generally southward to Ga., and n.e. Tex.

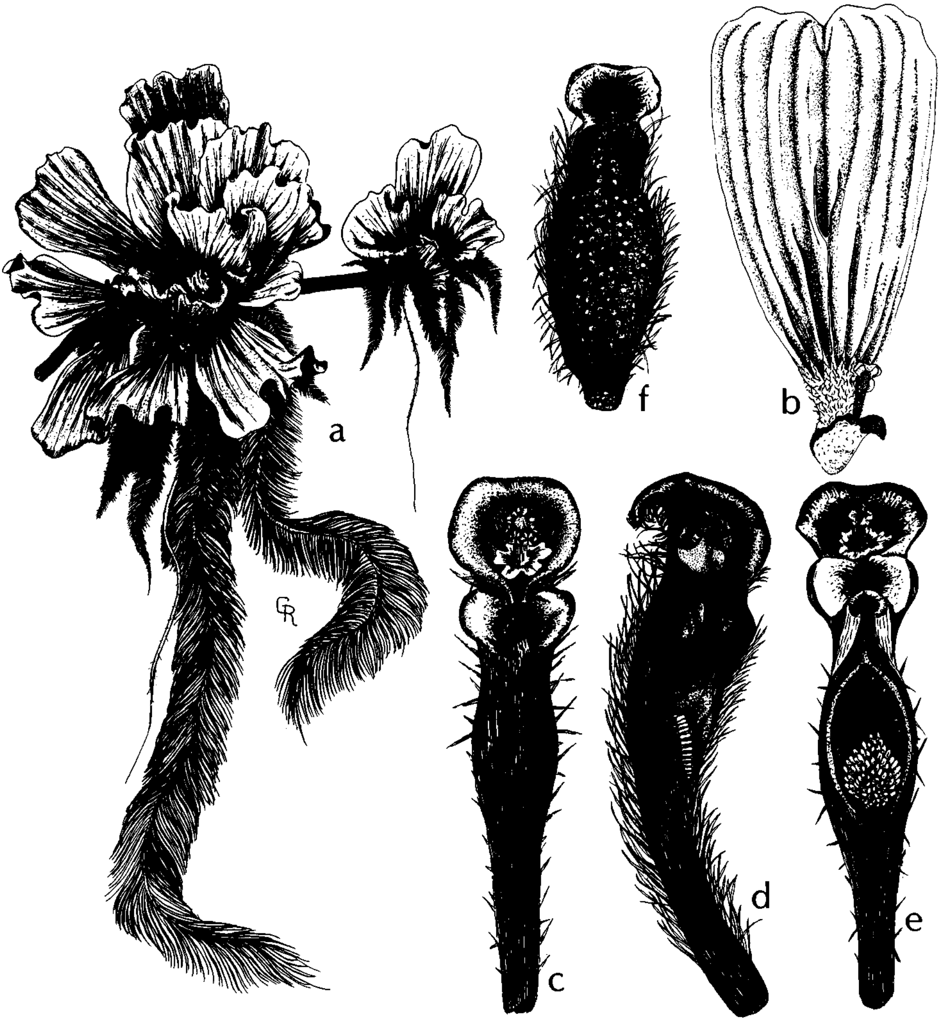

Fig. 270. **Pistia stratiotes:** a, habit; b, leaf; c, spathe, face view; d, spathe, side view, partially sectioned; e, spathe, face view, partially sectioned; f, partially developed fruit.

3. Arisaema

Low, herbaceous perennials with a subterranean corm from which arise a few bladeless papery sheaths and 1–2 (–3) bladed leaves with long sheathing bases; elongate overlapping convoluted sheaths give the appearance of an aerial stem; bladed leaves relatively long-petioled, compound. Scape emerging from within the sheathing leaf bases, bearing at its summit a spadix surrounded by a spathe, the latter convolute at least below, in some spreading and arched above. Spadix bearing unisexual flowers, all pistillate or all staminate on spadix of a given plant, or both on the same spadix, pistillate below, staminate above, in either case distal portion of spadix not flower-bearing. Flowers without a perianth; staminate of 2–5 almost sessile anthers; pistillate of a 1-locular ovary, very short style and broad stigma, the ovary bearing 5–6 ovules. Fruit a berry.

Plants of a given species of *Arisaema* vary a great deal in stature, depending in part upon age of plant and consequent size of corm, in part, probably, upon moisture and nutrient supply. There has been and remains a considerable diversity of opinion as to delimitation of taxa and application of names in what may be referred to as the *A. triphyllum* complex.

1. Leaf with 7–15, rarely 5, very unequal divisions, sometimes some of the divisions not cut to the extent of forming discrete leaflets, sometimes all are discrete leaflets; divisions pedately arranged, the axis disposed in more or less of a semicircle; summit of spathe with markedly rolled margins, the distal portion of the spadix long-exserted. 1. *A. dracontium*
1. Leaf with 3 or 5 palmately disposed leaflets; summit of spathe broad, arching over the spadix.
  2. In flowering specimens, leaf (or primary leaf if more than one) with 5 leaflets. 2. *A. quinatum*
  2. In flowering specimens, leaf (or primary leaf if more than one) with 3 leaflets. 3. *A. triphyllum*

1. Arisaema dracontium (L.) Schott. GREEN DRAGON. Fig. 271

Leaf usually solitary, its divisions 7–15, rarely 5, sometimes some of the divisions not cut to the extent of forming discrete leaflets, sometimes all divisions are discrete leaflets; leaflets variable in size and shape, lanceolate, oblanceolate, elliptic, or oblong-lanceolate, cuneate basally, some usually asymmetric, mostly short-acuminate apically, some sometimes acute or obtuse (range of variation commonly on a single leaf). Peduncle to 25 cm long, usually shorter than the petiole, spathe thinnish, green, slender, convoluted, spadix tapering to a long slender point, distally exserted from the spathe to 15 cm or more. Berries orange-red. (*Muricauda dracontium* (L.) Small)

In both mesic and damp to wet woodlands and thickets. Que. to Minn., generally southward to Fla. and Tex.

2. Arisaema quinatum (Nutt.) Schott. JACK-IN-THE-PULPIT, INDIAN-TURNIP.

Leaves 1 or 2; in flowering specimens leaves usually 2, the primary with 5 leaflets; if a second leaf present its leaflets usually 3; younger nonflowering specimens usually with one leaf with three leaflets: leaflets glaucous below, varying in size, even on a single leaf, the larger ovate, broadly oval, broadly elliptic, or nearly rhombic, the smaller lanceolate to narrowly elliptic, varyingly asymmetric to symmetric, cuneate basally, the larger short-acuminate apically, the smaller acute to acuminate. Peduncle shorter than to somewhat exceeding the petiole. Spathe convolute below, expanded above and usually arched over the spadix, green, thinnish, the spreading summit ovate, apically short-acuminate. Berry red.

Mostly in mesic woodlands, sometimes in damp to wet soils of springy seepage areas and along small streams in woodlands. N.C. and Tenn., s. to n. Fla. and e. Tex.

3. Arisaema triphyllum (L.) Schott. JACK-IN-THE-PULPIT, INDIAN-TURNIP. Fig. 271

Leaves 1 or 2, commonly (not always) 2 on flowering specimens, one on younger nonflowering specimens; leaflets 3, green or glaucous below, broadly elliptic, ovate, oval, or rhombic, cuneate basally, acuminate apically, the central usually symmetric, the

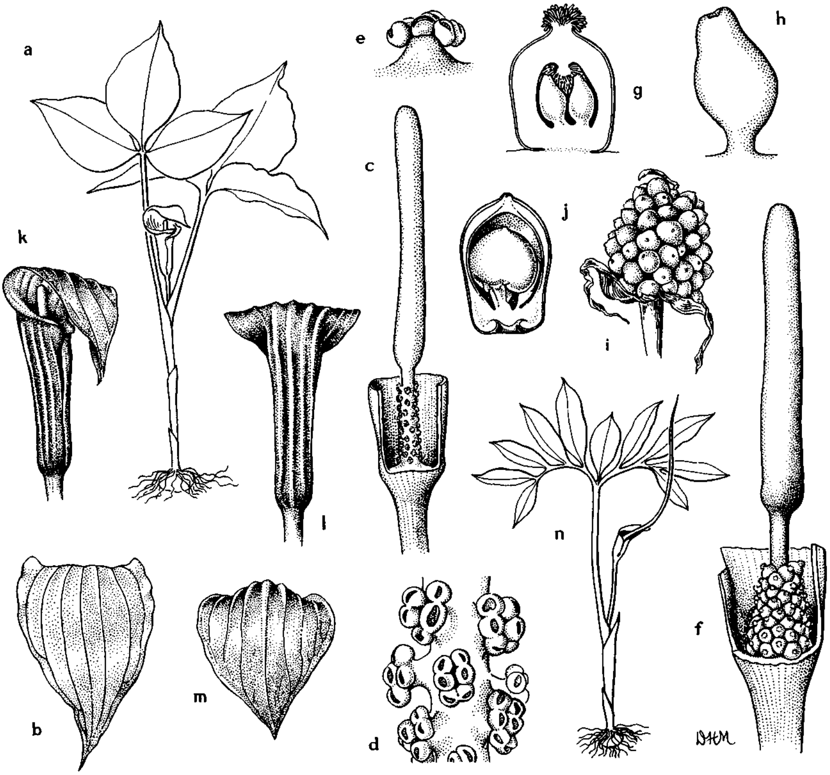

Fig. 271. a–j, **Arisaema triphyllum:** a, habit; b, spathe, apical view; c, staminate inflorescence, spathe removed; d, portion of staminate spadix; e, staminate flower, lateral view; f, carpellate inflorescence, spathe removed; g, carpellate flower, vertical section, showing ovules; h, ovule; i, fruiting spadix; j, fruit, vertical section, showing seed; k–m, **Arisaema triphyllum** *var.* **stewardsonii:** k, inflorescence, lateral view; l, inflorescence, back view; m, spathe, apical view; n, **Arisaema dracontium:** habit. (From Wilson in *Jour. Arn. Arb.* 41: 59. 1960. Nomenclature in part applied differently from that of Wilson)

lateral varyingly asymmetric. Peduncle usually shorter than the petiole, sometimes equalling or slightly exceeding it. Spathe convolute below, expanded above and arched over the spadix, very variable in coloration, green, striped green and brown or purple, brown or purple throughout, especially interiorly; sometimes corrugated with the raised corrugations usually whitish, purple-striped between (var. *stewardsonii* (Britt.) Stevens); apex of spathe acuminate. Berry red.

Mesic woodlands, moist to wet woodlands and swamps, bogs. N.S. to Minn., s. to Fla., s.w. Ark. and Tex.

4. Orontium

Orontium aquaticum L. GOLDEN CLUB. Frontispiece

Perennial herb with stout rhizomes deeply sunken in the substrate. Leaves simple, long-petioled, oblong-elliptic, 15–20 cm long, 5–10 cm wide, bluish green, entire, veins prominent, often floating, the upper surfaces with a sheen. Spadix on an elongated, lax or ascending scape, oblong, golden yellow, the scape green and with a band of white below the flowers. Spathe obscure, basal, sheathing, its blade small and bractlike. Flowers variable on a given spadix: basal ones bisexual, with 6 perianth segments, 6 stamens; and a 3-carpellate pistil; gradually becoming male toward the tip, the perianth segments from 6 in 2 whorls to 2 in a single whorl, the stamens 6–1, 1–2 staminodia sometimes present. Ovary 1-locular with a single basal ovule. Fruit a blue-green berry.

Shallow water, pools, streams and swamps. Chiefly coastal plain, Mass. to Fla., west to La.; locally central N.Y., W.Va. and Ky.

5. Colocasia

Colocasia esculenta (L.) Schott. WILD TARO, DASHEEN.

Perennial herb with thick vertical shoots from a large corm. Leaves long and stout-petioled; blades ovate, peltate, bases cordate to sagittate or hastate, apices obtuse to acute or short-acuminate; upper surfaces dark green and with a velvety sheen, lower paler; often with a purplish centrum and purplish band at the summit of the petiole. Inflorescence borne on a stout scape, usually much shorter than the petioles. Spathe yellow, lanceolate-ovate, constricted below the middle, enclosing the spadix. Spadix with female flowers below, male above, sterile between, the uppermost portion naked or with sterile flowers. Perianth absent. Male flowers comprised of several stamens united into a peltate body. Fruit a berry (not observed by us to fruit in our range.)

Along streams, marshes, marshy shores, drainage canals and ditches, marshy clearings. Member of an Asiatic genus, widely used in the tropics for its edible (when thoroughly cooked!) corm. This and other species used ornamentally. Widely naturalized in peninsular Fla., locally elsewhere in Fla. and some other southeastern states.

Reference: Young, R. A. "The dasheen, a southern root crop for home use and market." *USDA Farmers' Bulletin* 1396. Rev. ed., 1946.

6. Symplocarpus

Symplocarpus foetidus (L.) Nutt. SKUNK-CABBAGE. Fig. 272

Coarse perennial herb with the odor of skunk, having a stout, erect rhizome bearing a cluster of very large and broad, entire, veiny leaves, these forming in very early spring and preceded by the nearly sessile spathes which are at ground level. Spathe thick and fleshy, ovoid, with purple spots and inrolled margins. Flowers bisexual, with 4 fleshy perianth segments. Stamens 4, opposite the perianth segments. Ovary 1(–2)-loculed, imbedded in the spadix. Fruits borne in a globular or ovoid mass. Seeds subspherical.

Wet meadows, swamps, wet woodlands, often in dense stands. N.S., Que. to Ont. and Minn., southward to Ga. and Tenn.

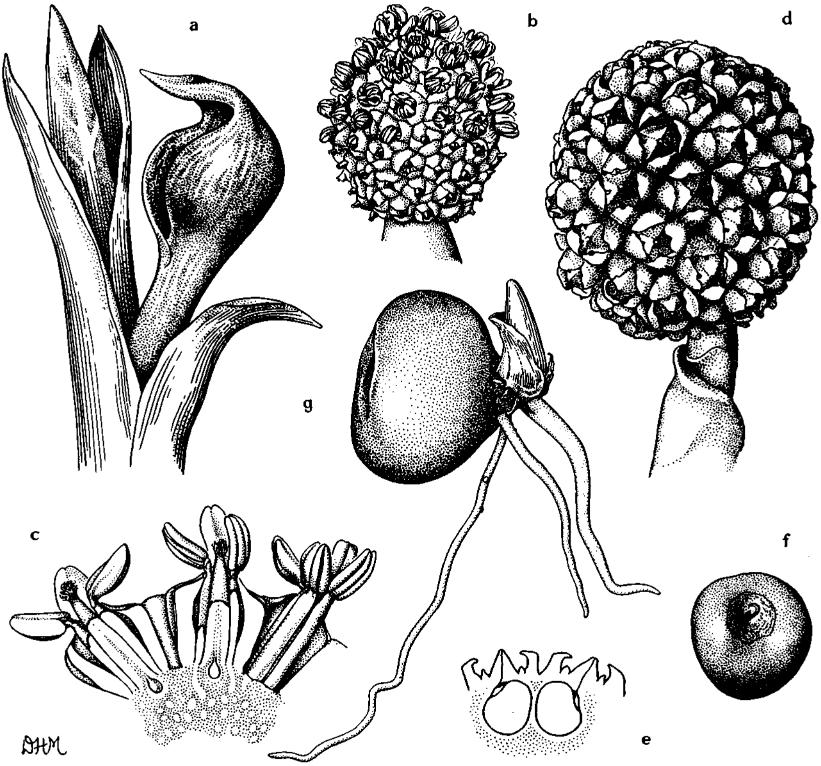

Fig. 272. **Symplocarpus foetidus:** a, habit of inflorescence; b, spadix; c, section through spadix, showing flowers in vertical section; d, fruiting spadix; e, section through fruiting spadix, showing seeds in vertical section; f, seed; g, seedling. (From Wilson in *Jour. Arn. Arb.* 41: 52. 1960)

7. Peltandra

Perennial herbs with long-petioled leaves clustered on short stems. Leaf blades sagittate or hastate, with 3 conspicuous palmate primary veins, to about 5 dm long, 2.5 dm wide. Spathe convolute or convolute below and dilated and spreading above. Spadix covered with flowers or the apex naked. Flowers unisexual, perianth lacking; male sessile, covering apical portion of spadix, comprised of 4–8, 2-loculed anthers embedded in the margin of a peltate shieldlike scale; female below, comprised of a 1-loculed ovary surrounded by 4–5 white fleshy staminodia; style short and thick with a terminal stigma. Fruits 1–3-seeded berries aggregated in a fleshy head enclosed by the leathery base of the spathe.

- Spathe thick and succulent throughout, green or green with white or cream-colored border; mature berries green to brown. 1. *P. virginica*
- Spathe succulent and green below, thin, flared-open and white above; mature berries red. 2. *P. sagittifolia*

1. **Peltandra virginica** (L.) Schott & Endl. GREEN ARUM. Fig. 273

Leaf blades variable in shape and size, up to 4–5 dm long and to 3 dm broad, in overall outline more or less ovate-triangular, bases hastate to sagittate; the basal lobes from short and rounded to very long and pointed. Spathe convolute below, opening slightly distally, or opening almost throughout, green with pale to white margins; lower part persistent and more or less enclosing the fruiting spadix. Spadix white to yellow or orange. Berries green to brown.

Swamps, marshes, wet clearings, ditches and drainage canals, shores. S.e. and s.w. Que. to Fla., generally westward to Mich., Ont. and to Mo. and Tex.

2. **Peltandra sagittifolia** (Michx.) Morong. SPOON FLOWER.

Leaf blades much less variable in size and averaging much smaller than in *P. virginica.* In overall shape and basal lobing similarly variable. Spathe with a relatively short, green, succulent, convolute portion around the female portion of the spadix, flaring above into a much longer, open, ovate to broadly elliptic, apically acuminate, thin white portion; the lower part persistent and about two-thirds enclosing the fruiting spadix; berries bright red. (*P. glauca* (Ell.) Feay ex Wood)

Bogs, swampy woodlands, wet hammocks. Coastal plain, e. N.C. to Fla. and Miss.

8. Xanthosma

Xanthosma sagittifolium (L.) Schott. ELEPHANT-EAR.

Fully developed, a very stout herb; with a basal corm, extending by offsets on short, relatively slender rhizomes. Leaves borne closely clustered from the summit of the corm, with overlapping sheathing bases, variable in size depending upon both age of plant and (in our range) time of year. Larger leaves with very stout petioles, these with broad rounded channels below, terete above, glaucous at least when young, to 18–20 dm long and to as much as 8–10 dm across at the base. Leaf blades not glaucous, not peltate, sagittate at the base, broadly angled at the summit, larger ones to 9 dm long from junction of petiole to tip and as wide or nearly so at the level of junction with petiole. Spathe convolute below, expanded above, the expanded portion creamy white. Fruits not seen.

Widely grown as an ornamental in the warmer parts of our range, sporadically naturalized in swampy woodlands and other wet places. Native in trop. Am.

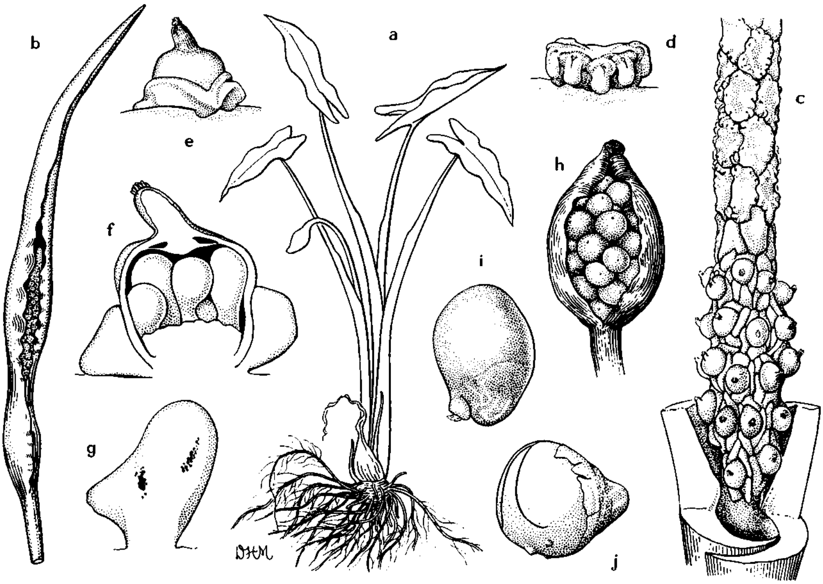

Fig. 273. **Peltandra virginica:** a, habit; b, inflorescence; c, spadix; d, staminate flower, lateral view; e, carpellate flower, lateral view; f, carpellate flower, vertical section, showing ovules; g, ovule; h, fruiting spadix enveloped by base of spathe; i, seed; j, seed, apical view, seed coat partially removed to show embryo. (From Wilson in *Jour. Arn. Arb.* 41: 55. 1960)

Lemnaceae (DUCKWEED FAMILY)

(Contributed by Howard L. Clark)

Members of the Lemnaceae are structurally the simplest and, in the genus *Wolffia,* the smallest of flowering plants, presumably by reduction from more complex ancestors. Small aquatic plants, free-floating on or below the water surface, commonly forming stands completely covering considerable areas of water surface, not infrequently to several cm thick when "piled up" by winds blowing across the water surface; some species produce overwintering, starch-filled, rootless plants (turions) which sink to the bottom. Plant bodies, "fronds" or "thalluses," not differentiated into stem and leaf, consisting of fleshy or membranous, lenticular, ligulate, or ellipsoid to spheroid fronds. Some rootless, some with 1 root, others with 2–several roots, the roots cylindrical, unbranched, hanging from near the center ("centrum") of the lower surface of floating fronds. Asexual, vegetative reproduction, occurring very rapidly at times, by budding from a basal pouch or from two lateral pouches, 1 or more "budded" ("daughter") generations commonly remaining attached to the parent frond by a short stipe. Flowering is infrequent in most species, certainly infrequently observed. Inflorescence of 1 or 2 staminate flowers, each with a single stamen, and 1 pistillate flower with a single pistil. *Lemna* and *Spirodela* inflorescences within a membranous spathe; *Wolffia* and *Wolffiella* without spathes. In *Spirodela* and *Lemna,* flowers are produced from the normally vegetative buds in one of the pouches; in *Wolffia* and *Wolffiella,* flowers are produced from within the tissues of the frond, not at the vegetative bud, within a small cavity (present only in fertile fronds) with an opening at the dorsal surface from which protrude the single stamen and pistil. Fruit a 1–6-seeded utricle.

References: den Hartog, C., and F. van der Plas. 1970. "A Synopsis of the Lemnaceae." *Blumea* 18: 355–368.

Clark, H. L., and J. W. Thieret. 1968. "The Duckweeds of Minnesota." *The Michigan Botanist* 7: 67–76.

The various kinds of duckweeds occur, often several kinds intermixed, in or on quiet or sluggishly moving waters of ponds, pools, lakes, swamps, streams, drainage ditches and canals, bayous and sloughs. A given kind or kinds may be present in relatively small numbers at a certain place at one time, in great abundance at the same place at another time. It is not uncommon, for example, to see a pond with duckweeds present only around its edges, followed by a "bloom" of a few weeks duration, such that the entire surface becomes thickly covered, then within another few weeks most or all disappear from the open water. Waters with high organic content seem to favor their growth but one sees them, as well, not necessarily in great abundance, in and on crystal clear water of the margins of springs and quiet waters of streams issuing from the springs. Plants are often "stranded" when water levels recede but remain alive so long as the substratum is wet.

No useful purpose is served in detailing habitats for the individual species.

Duckweeds, including species of all genera, are used as food by certain waterfowl. Minute animals associated with the duckweeds no doubt contribute greatly to the value of the diet.

1. Roots present on the lower side of the frond, reproductive pouches 2.
  2. Each frond with 2 or more roots. 1. *Spirodela*
  2. Each frond with 1 root. 2. *Lemna*
1. Roots not present, reproductive pouch 1.
  3. Frond subglobose, ellipsoid, or ovoid, not flat except on the upper side. 3. *Wolffia*
  3. Frond flat, membranous, ligulate to attenuate, solitary or 2 or more remaining attached. 4. *Wolffiella*

1. Spirodela (DUCKMEAT)

Fronds floating, or the turions submersed, solitary or in clusters of 2 or more, with 2–several (very rarely 1) roots near the center of the lower frond surface, 1 or more roots penetrating a membranous scale (prophyllum), dark lustrous green above, usually reddish purple below, reproductive pouches 2, lateral near the frond base.

- Frond broadly obovate to almost ovate, upper surface usually with a conspicuous red dot near the center, roots 5–20, only 1 (rarely 2 or 3) penetrating the prophyllum. 1. *S. polyrhiza*
- Frond narrowly obovate to almost reniform, upper surface usually without a red dot, roots 2–5 (very rarely 1), all penetrating the prophyllum. 2. *S. punctata*

1. Spirodela polyrhiza (L.) Schleid. Fig. 274

This is the largest, when fronds fully developed, of our floating duckweeds. The fronds are usually almost as wide as long, about 3–7 mm long, 3–6 mm wide. The smaller, starch-filled, rootless turions are produced during adverse conditions of temperature or drought, sinking to the bottom until environmental conditions improve, when the turion expels a small bubble of gas that carries the turion to the surface of the water where it germinates rapidly. This species may be present in almost pure stands in a given body of water, but more frequently it is intermixed with *Lemna, Wolffia, Wolffiella* (and other small aquatics).

Widespread in temperate and tropical latitudes but of limited distribution in Afr., absent in S.Am.

2. Spirodela punctata (Meyer) Thomps. Fig. 275

Fronds often are shaped like the sole of a shoe, 2–5 mm long, 1–3 mm wide. In general appearance this more closely resembles certain species of *Lemna* than it does *S. polyrhiza,* but can readily be distinguished from the Lemnas in that it has more than 1 root, has a prophyllum which produces tangential wings on the root sheath, and is usually darker green. (Incl. *S. oligorrhiza* (Kurz) Hegelm.)

An Old World species, introduced into this country as an aquarium plant, now naturalized. N.C., Ill., Fla., La., e. Tex., Calif., perhaps elsewhere. Locally very abundant in Fla. and La., often in extensive, almost pure stands.

2. Lemna (DUCKWEED, DUCKMEAT) Fig. 276

Fronds floating at the surface, or *L. trisulca* submersed, generally lens-shaped, elliptic to obovate, occasionally with inflated lower surface, pale green or green, often suffused with red, short-stipitate, or long-stipitate in *L. trisulca,* with a solitary root sheathed at its base just below the frond; reproductive pouches 2, lateral near the frond base.

Geographic distribution of the species not at all clearly understood.

1. Margin of frond dentate, serrate, or erose; stipe long-exserted; frond submersed or, only when fertile, most of the upper surface emersed; usually in chainlike clones. 1. *L. trisulca*
1. Margin of frond entire; stipe short, mostly inserted; upper surface of frond emersed; not in chainlike clones.
   2. Root sheath with lateral wings, apical and central papillae usually prominent, frond pale green, never red; fruit asymmetric, seed oblong. 2. *L. perpusilla*
   2. Root sheath not winged, apical papilla not prominent, frond green or pale green, often suffused with red; fruit symmetric, seed ovoid or semicordate.
      3. Frond narrowly elliptical, or broadly elliptical when extremely small, base distinctly oblique (the stipe lateral to the central axis of the frond), flat to slightly biconvex, pale green or green; seed asymmetric, semicordate. 3. *L. valdiviana*
      3. Frond broadly obovate to almost ovate, usually strongly biconvex, base not oblique (the stipe nearly in line with the central axis of the frond), yellowish green to green, usually suffused with red; seed symmetric, ovoid to ellipsoid.
         4. Lower surface of frond flat or slightly convex, upper surface usually without red, air spaces seen from below indistinct; fruit not winged, seed 1. 4. *L. minor*

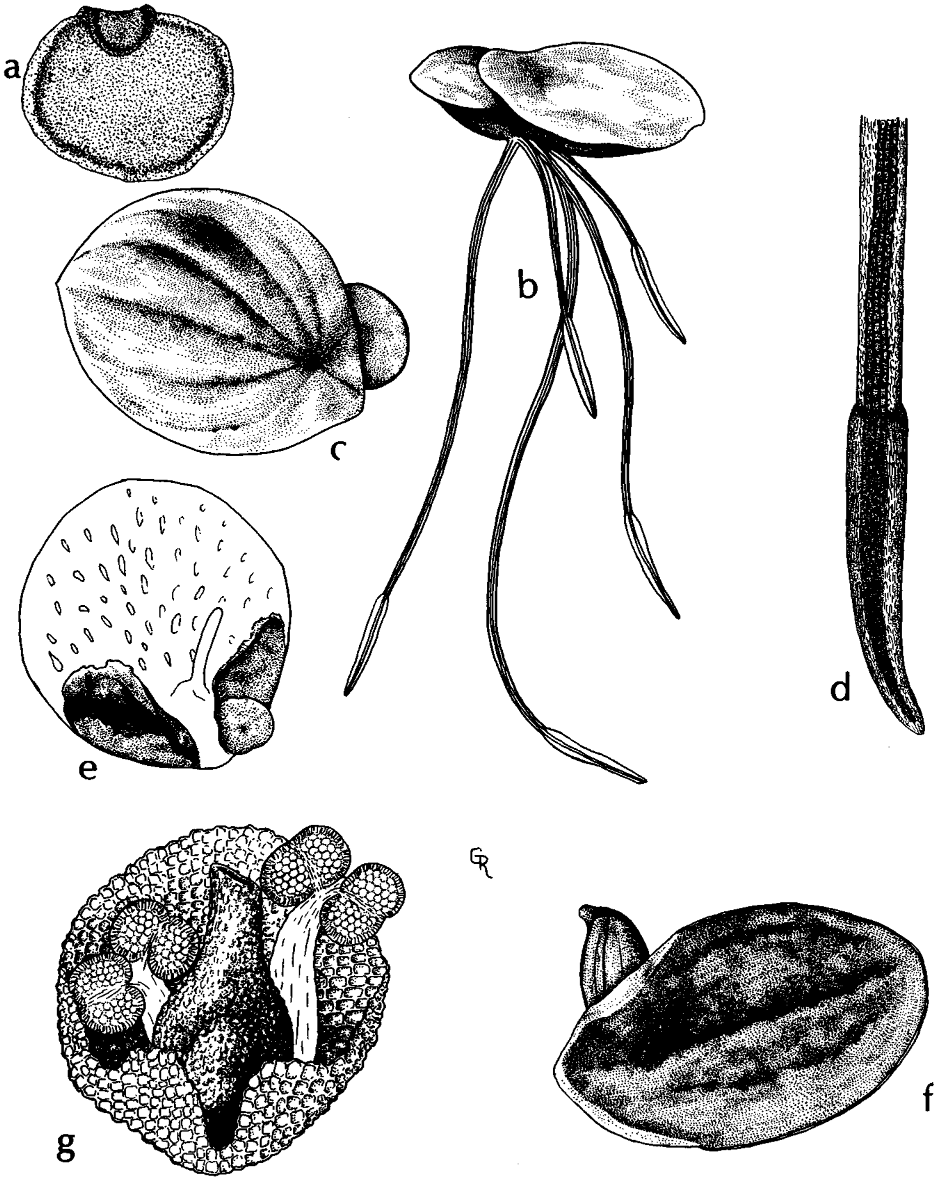

Fig. 274. a–e, **Spirodela polyrhiza:** a, dorsal view of turion with dorsal scale; b, habit; c, dorsal view of frond; d, distal portion of root; e, ventral view, pouch exposed; f–g, **Lemna perpusilla:** f, dorsal view of frond with fruit; g, inflorescence, with 2 staminate flowers, 1 pistillate flower.

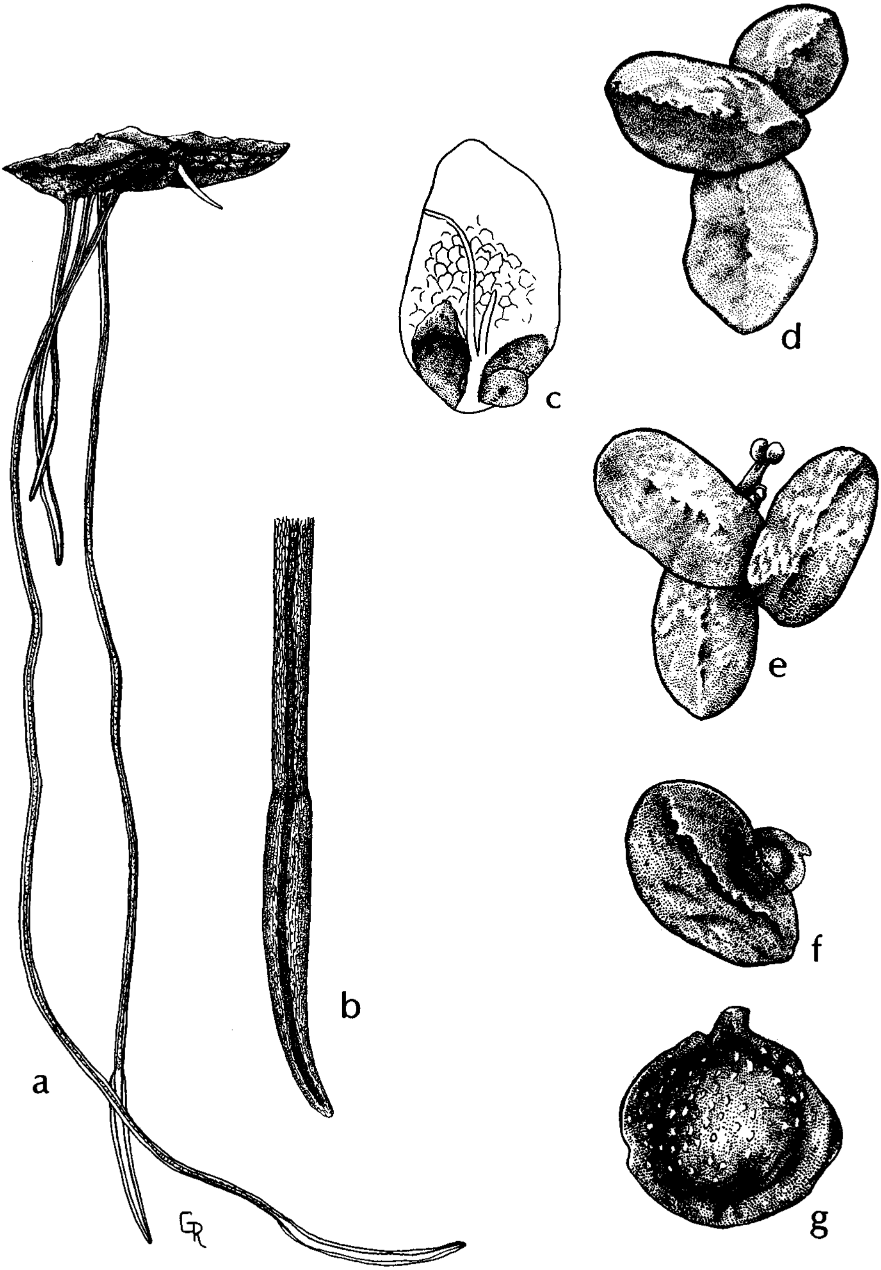

Fig. 275. **Spirodela punctata:** a, habit; b, distal portion of root; c, ventral view of frond exposing pouch; d, dorsal view of colony of 3 fronds; e, dorsal view of 3 fronds with stamen and pistil partially protruding; f, frond with fruit; g, fruit.

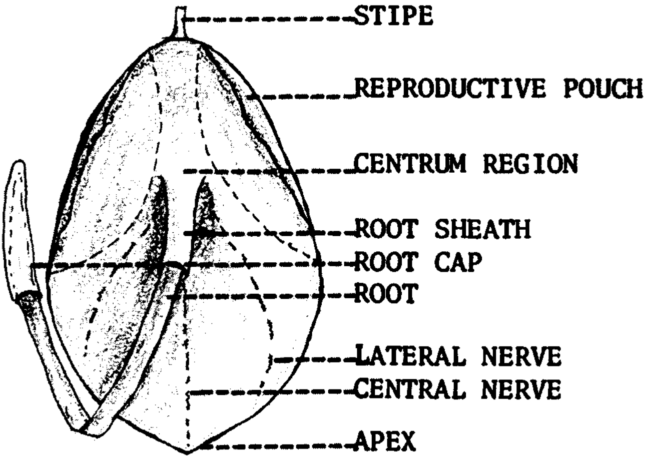

Fig. 276. **Lemna:** Diagrammatic sketch of frond, ventral view. (From Clark and Thieret (1968))

4. Lower surface of frond distinctly convex, usually bulging (gibbous), upper surface mottled with red, air spaces prominent; fruit winged, seeds 2 or more. 5. *L. gibba*

1. **Lemna trisulca** L. Fig. 277

Clones of 3–30 fronds joined together by long stipes continuous with the body of the frond, 4–15 mm long (not including stipe), 1.4–4.0 mm wide, apical margin of frond dentate or erose, root often deciduous, submersed except when flowering.

Identification, particularly of dried specimens, can be somewhat more difficult when the plants are in flower. In flowering condition, the fronds are shorter, thicker, suffused with red, and float on the surface of the water. These fertile fronds may be distinguished from other Lemnas by the nonentire apical margin, by the blunt continuous stipe, and by the more lateral position of the reproductive pouches.

N.S. to Alaska, locally generally southward more or less throughout the U.S. (not found in La.); Mex.; Old World.

2. **Lemna perpusilla** Torr. Fig. 274

Fronds solitary or 2–several connected, obovate to elliptic, asymmetric, 1.7–3.3 mm long, 0.8–2.5 mm wide, upper surface convex or keeled, usually with a prominent apical and a central (above the root) papilla and a median line of small papillae, lower surface flat to slightly convex, root sheath with lateral wings; fruit obliquely attached in pouch; seed oblong, deeply ribbed. (Incl. *L. trinervis* (Aust.) Small)

Temp. and tropical regions generally.

3. **Lemna valdiviana** Phil. Fig. 278

Fronds usually 2–5 connected, narrowly elliptic to oblong, falcate or nearly symmetric except for the oblique base, 0.7–4.6 mm long, 0.6–2.5 mm wide, upper surface flat or slightly convex, usually with a few very small median papillae, pale green; fruit elongate-ovate, plano-convex, seed semicordate. (Incl. *L. cyclostasa* (Ell.) Thomps. and possibly *L. minima* Phil.)

Widespread in W. Hemis.

4. **Lemna minor** L. Fig. 278

Fronds solitary or several connected, broadly obovate to almost ovate, 2–4 mm long, symmetric to slightly asymmetric, green to yellowish green, glossy when fresh, often

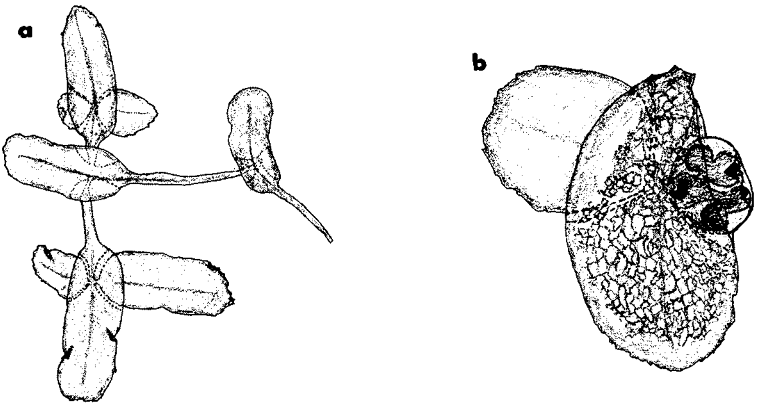

Fig. 277. **Lemna trisulca:** a, dorsal view, clone of several fronds; b, dorsal view, clone of two fronds, the larger with a spathe and flowers produced from the left-hand reproductive pouch. (From Clark and Thieret (1968))

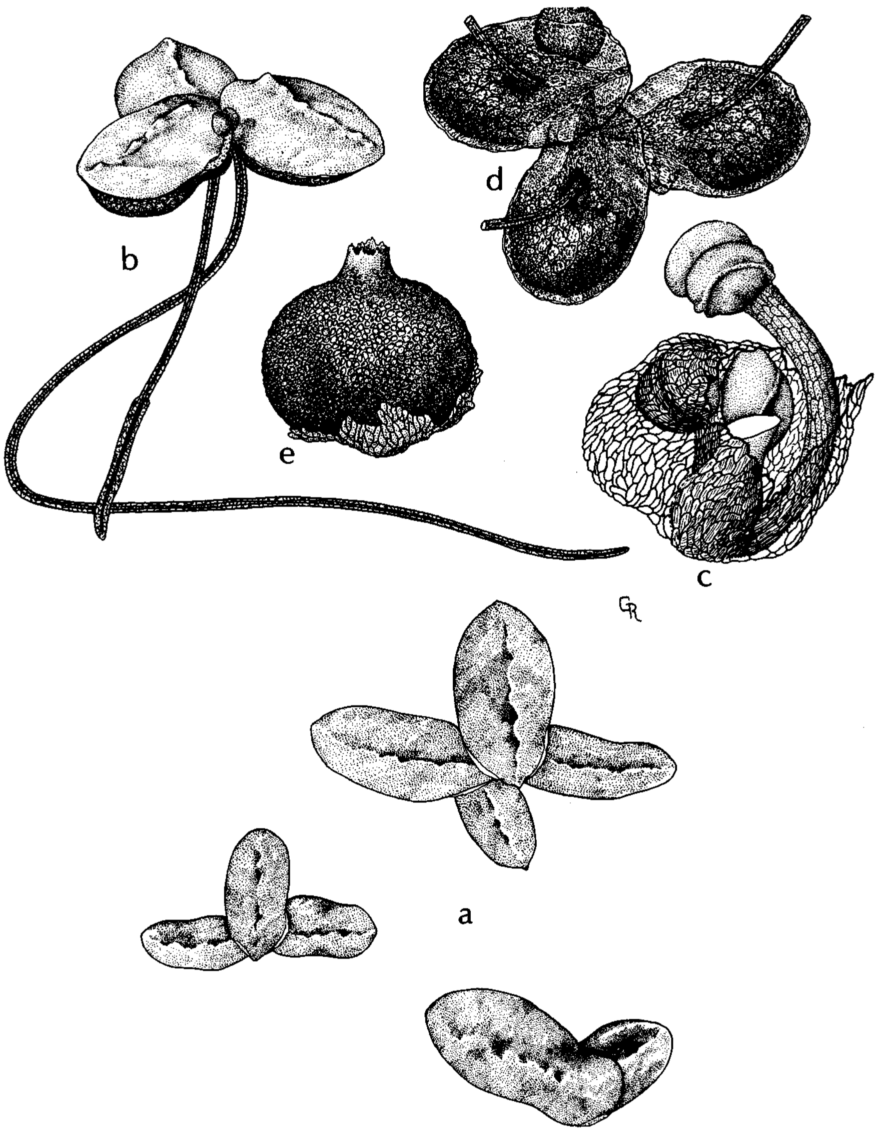

Fig. 278. a, **Lemna valdiviana,** dorsal views; b–e, **Lemna minor:** b, dorsal view of 3 fronds, stamen protruding from pouch of 1 frond; c, inflorescence with ruptured spathe; d, ventral view of 3 fronds (roots partially excised), fruit protruding from pouch of 1 frond; e, fruit.

suffused or mottled with red on lower surface, and occasionally on upper surface, upper surface convex or somewhat flattened, with a small central papilla and usually a median line of smaller papillae extending to near the apex, lower surface convex (or, rarely, concave when growing in insufficient light or nutrients) with a deep root-furrow, air spaces not prominently enlarged, root sheath not winged; fruit and solitary seed ovoid or ellipsoid, not winged. (Incl. *L. obscura* (Aust.) Daubs)

Nearly worldwide.

5. Lemna gibba L.

Fronds solitary or several connected, orbicular to obovate, 3.5–6.0 mm long, symmetric or nearly so, green to yellowish green, mottled with red above and below, upper surface flat to slightly convex, with a central papilla and usually a median line of smaller papillae extending to near the apex, lower surface convex to bulging (gibbous), occasionally almost flat (which may represent a hybrid with *L. minor?*), with a deep root-furrow, air spaces prominently enlarged, root sheath not winged; fruit ovoid to ellipsoid, the sides winged, seeds 2–6, ovoid to ellipsoid.

L. gibba and *L. minor* are clearly distinguishable when fertile (which is rare), but are very difficult to distinguish vegetatively, particularly the questionable "flat form" of *L. gibba.* Some of the reportedly diagnostic, but not infallible, characters are that *L. minor* has symmetrical, obtuse apices, reproductive pouches extending less than ⅖ of the length of the frond margin, and pouch margins not curling on drying, whereas *L. gibba* has oblique apices, pouches greater than ⅖ of the front margin length, and thin pouch margins that curl on drying, as well as being generally longer than *L. minor.*

Distributed throughout much of the world.

3. Wolffia (WATER-MEAL)

Tiny, floating, rootless plants, barely discernible to the naked eye, seldom exceeding 1.5 mm in any dimension. Fronds ellipsoid to ovoid, the upper emersed surface with a very small flattened area or flattish nearly all across, seldom more than two fronds connected, green or pale green, a single funnel-shaped vegetative reproductive pouch at base. One carpellate (with one ovule) and one staminate (with one stamen) flower borne in a central cavity ("pouch") within the frond, the cavity present only in flowering fronds, the anther and upper style protruding through the upper frond surface at anthesis.

Sometimes numerous enough to form a solid, pure stand. Commonly intermixed with other duckweeds. I sometimes test for its presence by taking a handful of whatever duckweeds are present and rubbing them between the palms of the hands. If *Wolffia* is present it gives the feeling of granularness or mealiness.

1. Upper surface of frond smooth, flattened (best seen in side view), frond usually brown-punctate, especially visible when dead (dry or in liquid preservative), cells inflated in lower portion of frond, progressively smaller and more compactly arranged toward upper surface.
    2. Frond upper surface with a conical papilla near the center, sloping to the rounded distal end. 1. *W. papulifera*
    2. Frond upper surface flat, except for the raised acute apex. 2. *W. punctata*
1. Upper surface of frond convex, or a small portion slightly flattened and roughened with several very minute central papillae, apex blunt, frond not punctate, cells of frond uniformly inflated. 3. *W. columbiana*

1. Wolffia papulifera Thomps. Fig. 279

Fronds slightly asymmetric, obliquely broadly ovate to elliptic in horizontal outline, rounded or obtuse apically (distal end, opposite the pouch), upper surface flat marginally, elevated centrally to a conical papilla, green above, paler green below, usually punctate on all surfaces (the punctae yellowish brown or dark brown cells, scarcely visible in living fronds except under reduced light at high magnification, most apparent in dry plants).

Va., w. to Ill. and Kans., s. to Fla. and e. Tex.; Mex.

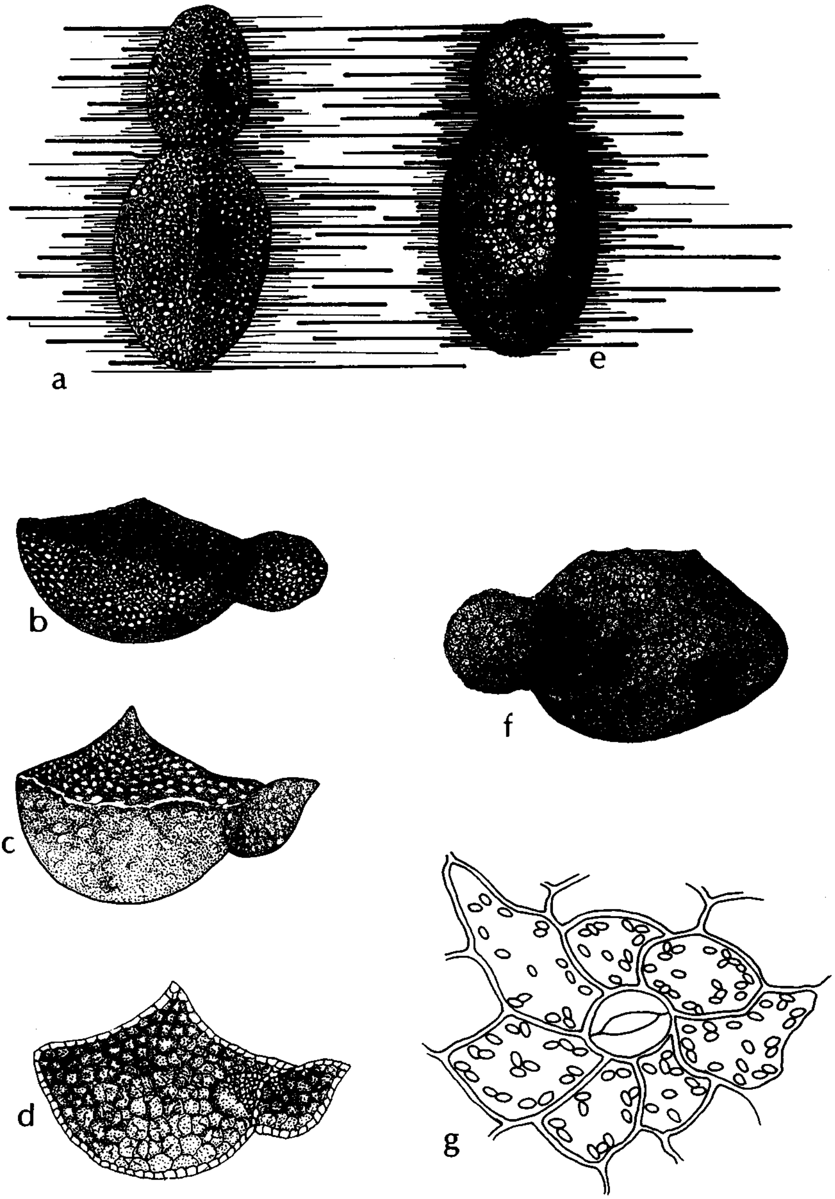

Fig. 279. a–d, **Wolffia papulifera:** a, dorsal view; b–c, lateral views; d, longitudinal section; e–g, **Wolffia columbiana:** e, dorsal view; f, lateral view; g, some cells (greatly enlarged) of emersed dorsal flat portion of frond to show stoma.

2. Wolffia punctata Griseb. Fig. 280

Fronds elliptic to narrowly elliptic in horizontal outline, upper surface smooth, flattened, with a raised acute apex, green above, paler below, usually punctate on all surfaces.

Conn. to Ont., Minn., s. to Fla. and e. Tex.; W.I.

3. Wolffia columbiana Karst. Fig. 279

Fronds symmetric, globose to broadly elliptic in horizontal outline, upper surface convex, smooth or roughened with a few minute papillae, apex round, green, no punctae.

The cells of *W. columbiana* are more or less uniformly inflated throughout the frond so they are uniformly green, but the inner cells of *W. papulifera* and *W. punctata* are progressively smaller and less inflated from lower to upper surface, causing the fronds to appear darker above than below when viewed laterally in transmitted light.

N.E. to Ont., w. to Calif., southward in the U.S.; Mex. to n. S.Am.

Wolffiella (MUD-MIDGET, BOG-MAT)

Fronds floating near the surface of the water, submerged, or basal portion of the upper surface of flowering fronds emersed; rarely solitary, usually 2 or more attached by short, oblique, basal stipes. Frond asymmetric, thin, flat to once or twice spiralled longitudinally or curved downwards, linear-attenuate to broadly lingulate, rootless, pale green, often punctate; vegetative reproductive pouch solitary, horizontally triangulate, basal. One carpellate (with one ovule) and one staminate (with one stamen) flower borne in a cavity in the base of the frond to one side of the median line.

The following keys and descriptions of *Wolffiella* are limited primarily to vegetative characters, as *Wolffiella* fronds change shape drastically when they are fertile, and even apparently vegetative fronds in an otherwise fertile population assume at least some of the "fertile" shape. Fronds that are incipiently fertile are usually shorter, narrower apically, broader basally (to accommodate the floral cavity), straighter, and more nearly flat than are "typical" vegetative fronds. The extent of air spaces also varies considerably. The bases of fertile fronds, to about a third the length of the frond, are always emersed and usually contain stomates in the emersed portion near the floral cavity, the anther and pistil thus above the water surface. Fronds in this "fertile form" are often impossible to identify using any descriptions available in the literature, the occasional exceptions being *W. floridana* or *W. lingulata.*

1. Frond lingulate, broadly oblong, apparently symmetric to strongly falciform; air spaces occupying the basal third to half of the frond; stipe scar blunt, truncate; angle of the reproductive pouch 60–100 degrees; apex (distal end of frond) blunt. 1. *W. lingulata*
1. Frond without all of the above combination of characters.
  2. Apex of frond obtuse; air spaces occupying two-thirds or more of the frond; angle of the reproductive pouch 40–50 degrees; frond oblong to narrowly elliptic, flat, straight or very slightly falcate, sides of frond approximately parallel. 2. *W. oblonga*
  2. Apex of frond narrowly rounded to attenuate; air spaces occupying half or more of the frond; frond lanceolate to linear-attenuate.
    3. Base of frond broad, tapering abruptly to the rounded apex, frond often asymmetric near the apex, with one side of the frond conspicuously indented; frond slightly falcate or straight, almost flat, narrowly lanceolate. 3. *W. gladiata*
    3. Base of frond narrow to broad, tapering gradually to the narrow apex; frond falcate or sigmoid, usually curled downward, very narrowly lanceolate to linear-attenuate. 4. *W. floridana*

1. Wolffiella lingulata (Hegelm.) Hegelm. Fig. 281

Fronds broadly oblong to broadly linear, solitary or 2 attached, occasionally forming compact colonies, 3.5–10.0 mm long, 1.2–5.3 mm wide, 1–8 times longer than wide with

Fig. 280. **Wolffia punctata:** dorsal view (left), lateral view (right). (From Clark and Thieret (1968))

the shorter fronds usually having the greatest width, concave dorsally except in flowering fronds, frond apex curved downward, the whole frond thus forming a semicircle when viewed laterally, or occasionally long fronds twisted spirally along the frond axis, base obliquely truncate, apex blunt, rounded, air spaces occupying basal ⅓–½ of frond, angle of the reproductive pouch 60–100 degrees. Flowering fronds are usually much flatter and narrower.

La., Calif.; Mex., Panama, Uru.

2. **Wolffiella oblonga** (Phil.) Hegelm. Fig. 281

Frond oblong to narrowly elliptic, sides parallel for most of their length, flat, straight to slightly falcate, solitary or 2, occasionally more, remaining attached, 1.5–4.0 mm long, 0.5–1.6 mm wide, not distinctly concave above, apex rounded to obtuse, air spaces occupying ⅔ or more of the frond from the base, angle of reproductive pouch opening 40–50 degrees.

This is a questionably distinct species which may only represent the "fertile form" of another species. It is reportedly distinguished by having pollen smaller than other Lemnaceae, but is very rarely found in flower (or is not distinguishable from other species when in flower, so is not correctly identified?). (den Hartog and van der Plas, 1970, propose this as the type species of *Wolffiella.*)

Fla., La.; C.Am. and S.Am.

3. **Wolffiella gladiata** (Hegelm.) Hegelm. Fig. 281

Fronds narrowly lanceolate, tapering from a relatively broad base to a narrow rounded apex, often falcate near apex, one side often indented near the apex, solitary or several remaining attached, 4.0–8.4 mm long, 0.5–1.4 mm wide at base, 5 to 10 times as long as wide near middle of frond, air spaces occupying ¾–⅘ of length of frond, angle of reproductive pouch opening 35–45 degrees. (Flowers and fruit are not known for this species.)

La., Tex., and Calif.; s. to Uru.

4. **Wolffiella floridana** (J. D. Sm.) Thomps. Fig. 281

Fronds elongate, tapering from a narrow base to an attenuate sharply pointed apex, falcate or doubly falcate, often slightly constricted near the base, usually connected forming starlike submersed or floating colonies, 4.5–10.0 mm long, 0.3–0.7 mm wide in widest part above base, air spaces about $\frac{9}{10}$ of length of frond, angle of reproductive pouch opening 20–35 degrees. Flowering or fruiting fronds usually single, their bases broader and thicker than those of nonflowering fronds.

Mass. to Wis., s. to Fla. and e. Tex.

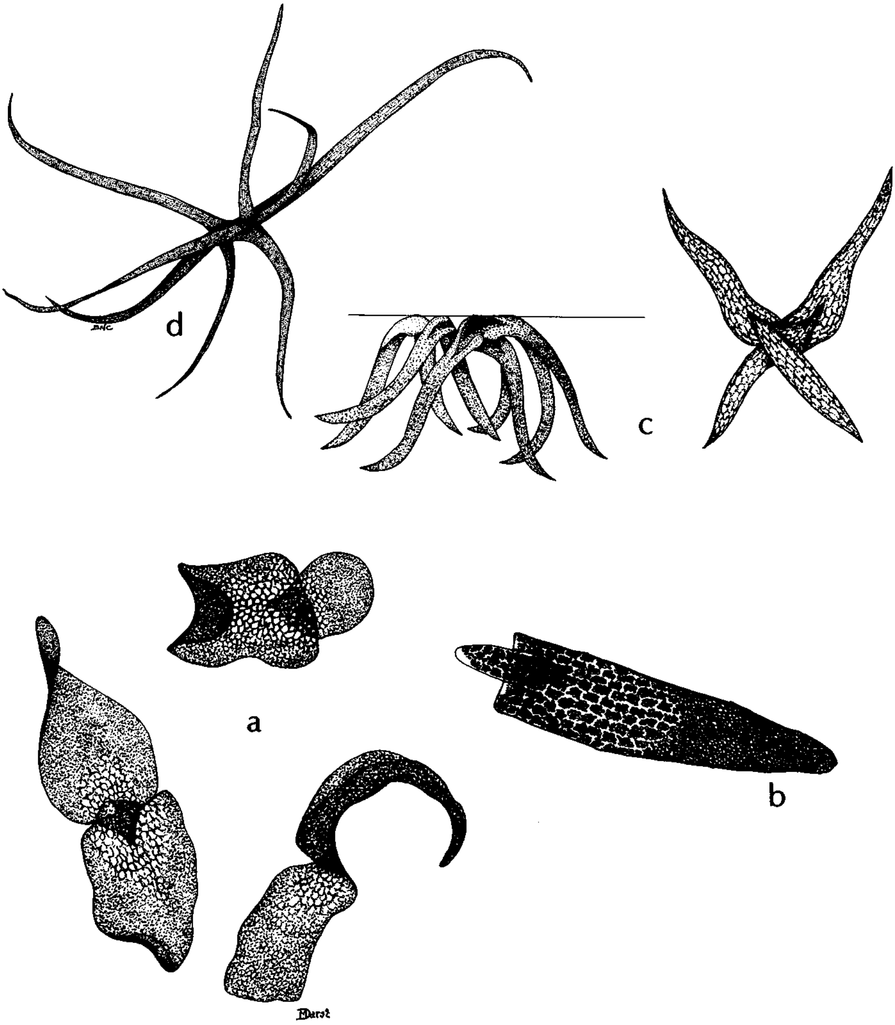

Fig. 281. a, **Wolfiella lingulata:** some typical vegetative shapes; b, **Wolfiella oblonga:** dorsal view; c, **Wolfiella gladiata:** clone of 4 fronds, dorsal view at right; d, **Wolfiella floridana:** clone of several fronds. (a, b, redrawn from Clark (1970); c, redrawn from Bravo (1930))

Mayacaceae (BOGMOSS FAMILY)

Mayaca fluviatilis Aubl. BOGMOSS. Fig. 282

Perennial herb of shores or truly aquatic. Plants on shores, in wet soil or in shallow water, forming dense tufts or mats with the aspect of a moss or clubmoss. In deeper water the stems very much longer, lax, the leaves more distant from each other and thinner and more flexuous. Leaves spirally arranged, sessile, numerous, linear-lanceolate or narrowly linear, 3–14 mm long and 0.5–1 mm wide, the tips entire or somewhat bifid, midvein evident. Flowers solitary in the leaf axils, their stalks short at first, usually lengthening as the fruit develops, becoming as much as 4.0 cm long. Sepals 3, lanceolate, their tips acute to acuminate, persistent on the fruit, 4–5 mm long. Petals 3, pinkish to violet or white, obovate or broadly oval, as long as or slightly exceeding the sepals. Stamens 3, alternate with the petals. Ovary superior, 1-locular with three parietal placentae, style 1. Fruit a thin-walled capsule, more or less oval but knobby owing to seeds bulging against the walls, 4–5 mm long, dehiscing between the placentae. Seeds 4–25 per capsule, not all maturing at once, at maturity brown and somewhat iridescent, ovoid-globose, the surfaces irregularly ridged–tuberculate-reticulate. (*M. aubletii* Michx.)

Seepage slopes, spring runs, shallow to deep water of marshes, streams, ponds or lakes, drainage ditches and canals. Often in water to at least 2 m deep where it apparently flowers and fruits under water. Coastal plain, N.C. to Fla. westward to southeastern Tex.; trop. Am.

In some instances bogmoss is abundant on wet shores but does not extend continuously into deeper water. In other instances it is abundant in fairly deep water but does not occur in decreasing water level gradients shoreward. Sometimes it abounds on wet shores and extends continuously into deeper water. Where there is a continuous local distribution from shores to deeper water there is a gradient in character of the vegetative body from one extreme out of water to another in deep water. Certain differences in the morphological characters of the reproductive parts have been correlated with the extremes of the vegetative parts thus the shore form has apparently been distinguished as *M. aubletii*, the deep water form as *M. fluviatilis* by authors. We infer from our observations that there is in our area but a single species.

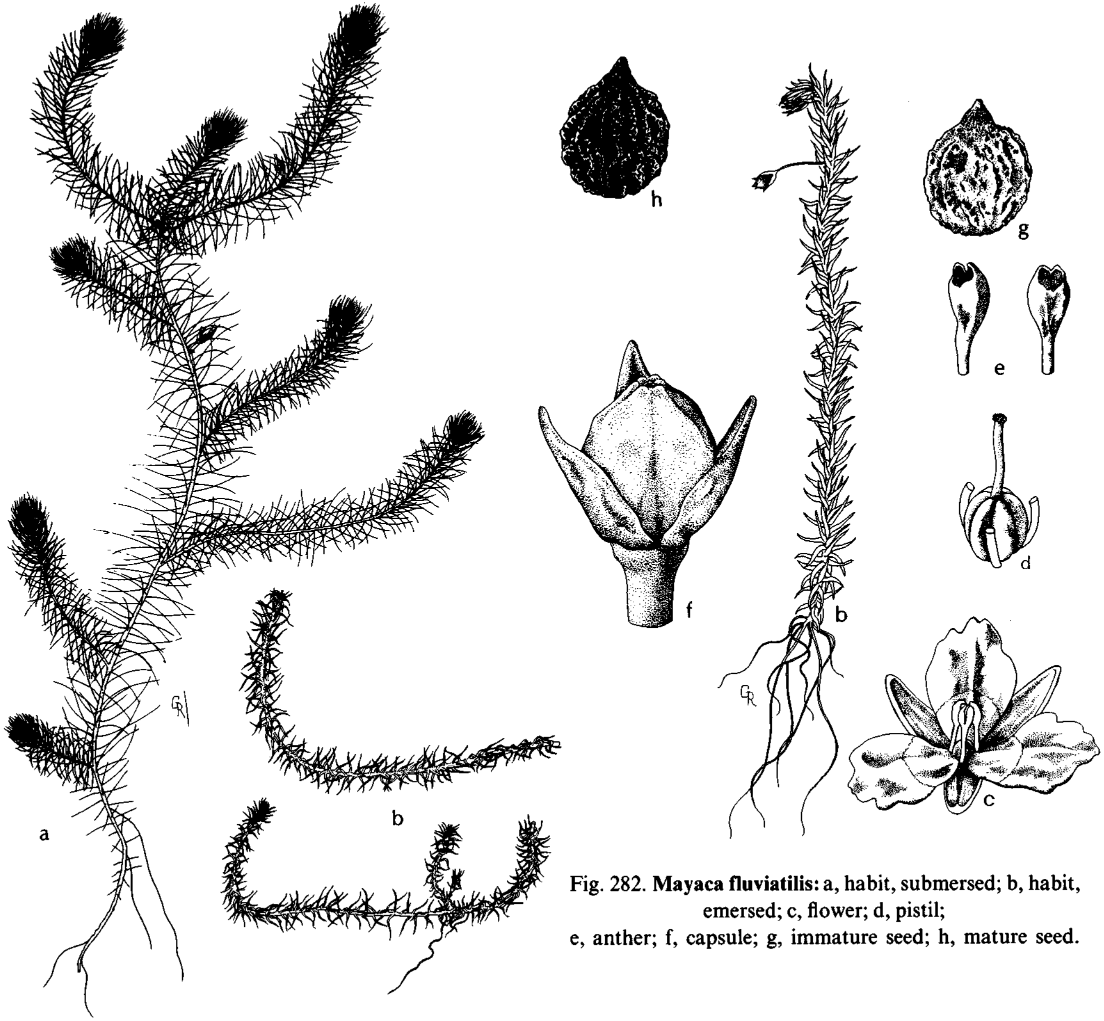
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Fig. 282. **Mayaca fluviatilis:** a, habit, submersed; b, habit, emersed; c, flower; d, pistil; e, anther; f, capsule; g, immature seed; h, mature seed.

Xyridaceae (YELLOW-EYED GRASS FAMILY)

(Contributed by Robert Kral)

Perennial, tufted or solitary, scapose herbs from short, soft, fibrous or bulbous bases, the roots fibrous, but fleshy. Leaves basal, tufted, equitant, distichous, the blades linear or terete-filiform, the bases abruptly or gradually dilated. Inflorescence a contracted, compact, bracteate, conelike spike, the bracts spirally arranged. Flowers perfect, zygomorphic, in the axils of leathery or chaffy, imbricate, bracts, the perianth members all separate, the corolla ephemeral. Calyx of 3 members; the inner 2 boatlike, chaffy, keeled, and persistent, the outer 1 membranaceous, and covering the flower in bud. Corolla of 3 subequal members each comprised of a broad, yellow or white blade, and a long narrow claw which is concealed by the subtending bract. Stamens 3, adnate to the corolla by their filament bases, the anthers divided into 2 thecae by the broad connective; staminodia 3, alternating with the petals, bifid, their margins simple or lined with multicellular trichomes. Ovary superior, 3-parietal, with the placentae somewhat intruding toward their apices; style 3-branched above, the branches each conduplicately folded and terminating in a truncate, short bearded, stigma. Fruit capsular, oblong-compressed, the thin pericarp with valvular or irregular dehiscence. Seeds small, striate or striate-reticulate, ovoid, ellipsoidal, or fusiform, usually apiculate or caudate.

1. Keel of lateral sepals ciliate or fimbriate (sometimes entire in *X. brevifolia*).
  2. Tips of lateral sepals exserted beyond the subtending bract, fimbriate (usually crisped); spikes seldom shorter than 1 cm; seeds seldom shorter than 0.8 mm, fusiform, with broad, flat, longitudinal ridges; sheaths of the scape exceeded by the leaves.
    3. Scape ridges conspicuous, harsh to the touch; spikes ovoid or broadly ellipsoidal, dull brown; bases of leaves soft, straw-colored to pale green or pinkish; flowers opening in the morning; plants of very wet substrata, the bases often submersed. 14. *X. fimbriata*
    3. Scape ridges lower, less conspicuous, smooth (minutely tuberculate or papillose under magnification); spikes narrowly ellipsoidal or lance ovoid, comparatively lustrous; bases of leaves swollen, bulbous, a lustrous chestnut brown, deeply sunken in the substratum; flowers usually opening in the afternoon; plants of moist, but certainly not wet, substrates. 10. *X. caroliniana*
  2. Tips of lateral sepals not exserted beyond the subtending bract and not fimbriate (in old or dried spikes the lateral sepals may separate from the bracts and appear to be exserted, but exsertion is supposed to mean that bracts are shorter than sepals); seed lengths and shapes various, but the seeds without broad, flat, longitudinal ridges; sheath lengths various.
    4. Sheaths of the scapes longer than, or equal in length to, the longer leaves.
      5. The sheaths of the mature scapes as long as or slightly shorter than most of the main foliage leaves. 1. *X. drummondii*
      5. Sheaths of the scapes surpassing most or all of the larger leaves.
        6. Leaves flabellately arranged or ascending, usually narrowly linear; plants characteristically in brown-based clumps of a large number of scapes, the living leaves characteristically green above a stramineous, brown, green or pinkish base; spikes broadly ovoid, but more often globose or hemisphaerical or turbinate, the bracts with thin, erose, maroon or reddish brown, lacerate borders, keelless; lateral sepals linear-curvate, the keels entire or with distant papillae or ciliae (tips of lateral sepals may resemble tips of upper bracts in being thin, erose, and colored). 2. *X. brevifolia*
        6. Leaves flabellately arranged, broadly linear-curvate; plants characteristically solitary or in small tufts of few scapes (often the leaves are curved toward or flattened against, the sandy substratum, or buried partially in it); living leaves characteristically maroon, save for a pale, scarious margin along the equitant portion; spikes ovoid, acute, the bracts often keeled, the bract margins not differently colored or colored only at the very apex, entire or subentire; lateral sepals curvate or sigmoid, the wings broad, the keel ciliate-scabrid (this species may be distinguished during the winter rosette stage by its deep maroon, diminutive, curvate fans of leaves in contrast to the straighter, narrower, usually greener, leaves of *X. brevifolia*). 3. *X. flabelliformis*

4. Sheaths of the scape definitely exceeded by the main foliage leaves.

7. Mature spikes 1 cm long or longer, the larger leaves 10 cm long or longer; sheaths of the scape with short-cusplike blades.

8. Leaves ascending, twisted, strongly grooved; spikes ovoid, the bracts and lateral sepals with a small apical tuft of short, reddish brown hairs; bases of leaves abruptly expanded, pinkish or purplish, becoming dark brown, the bases of the plants therefore bulbous and the outermost leaves often scalelike. 13. *X. torta*

8. Leaves spreading, scarcely twisted; spikes narrowly ovoid, ellipsoidal or oblong; bracts and sepals not as above; bases of leaves longitudinally striate (the innermost fresh leaf bases white, the striae in sharp dark contrast) and with the bases of the plants often invested by a stubble or ramentum of fibrous dead leaf bases.

9. Seed farinose, dark when dry and ripe; spikes oblong-cylindric; plant bases maroon, purplish, dark brown or reddish brown, usually caespitose on muddy, often submersed substrata; leaves narrowly linear, gradually tapering from the equitant base to tip; petal blades sharply cuneate, 0.5 cm long, or less, opening about midday. 8. *X. stricta*

9. Seed translucent, usually paler when dry and ripe; spikes lance-ovoid or ellipsoidal; plant bases usually paler in color, usually in small clumps or solitary on moist but seldom mucky substrata; the leaves shorter, broader, more flabellately spreading; petal blades obovate, about twice the size of those of *X. stricta,* opening in early morning, closing toward midday. 7. *X. ambigua*

7. Mature spikes 5–7 mm long, few-flowered, larger leaves 4–15 cm long; sheaths of the scape from ½ to nearly as long as the principal leaves (plants similar in general appearance to *X. baldwiniana* and so far as known only from Bay and Washington Cos., Florida). 6. *X. isoetifolia*

1. Keel of lateral sepals lacerate, usually quite thin, rarely entire.

10. Leaves narrowly linear or filiform, the blades gradually expanding below into lustrous, rich brown or tan, hard bases; the plants densely caespitose, the spikes ovoid and seldom longer than 1 cm.

11. Leaves linear, flattened in the cross-section of the blade, and with an evident, paler and incrassate, margin; scape usually narrower than the leaf blades (save for some filiform-leaved populations in southern peninsular Florida), often 2-edged above; staminodia bearded; seeds ellipsoidal, seldom longer than 0.6 mm. 4. *X. elliottii*

11. Leaves filiform, terete to broadly elliptic or blocky in the cross-section of the blade and without an evident, incrassate pale margin; scape at least as broad as, usually broader than, the leaf blades, and terete or but slightly edged at one spike-length below a spike; staminodia beardless; seeds narrowly ellipsoidal, nearly 1 mm long. 5. *X. baldwiniana*

10. Leaves broader or not as above, the leaf bases softer or of a different color; the plants or spikes not as above.

12. Lateral sepals exserted beyond the tips of subtending bracts.

13. Ripe seeds ellipsoidal, dark amber, not longer than 0.6 mm, the longitudinal and cross-lines conspicuous and fairly regular; thus the alveolae regularly rectangular; keel of the lateral sepals tending to be ciliate toward its base, lacerate above toward the tips. 16. *X. longisepala*

13. Ripe seeds narrowly ovoid or oblong, never as short as 0.6 mm, the longitudinal and cross-lines conspicuous but not so regularly disposed and generally forming broader alveolae; base of keels of lateral sepals lacerate. 15. *X. smalliana*

12. Lateral sepals included, hidden by the subtending bracts.

14. The bases of the leaves rather abruptly expanded into thickened, flaring, equitant zones, thus the plants bulbous-based (the outer leaves are often shorter, darker, scalelike); scapes often flexuous, usually quite twisted; green, upper portion of leaf blades often conspicuously twisted; flowers opening in the afternoon.

15. Leaf and scape surfaces smooth or scabrous only along the margins and ridges; petal blades obovate; spikes commonly oblong or narrowly ovoid; plant bases pinkish; seeds ovoid, seldom longer than 0.6 mm. 11. *X. platylepis*

15. Leaf and scape surfaces prominently papillose or tuberculate-scabrid, thus the foliage having a "glazed" look; bases of young or flowering plants pinkish or purplish; petal blades suborbicular; seeds narrowly ovoid or narrowly ellipsoidal, about 1 mm long. 12. *X. scabrifolia*

14. The bases of the leaves and the plant bases not as above; scapes usually not flexuous, the blades not conspicuously twisted; flowers opening in the early or late morning.

16. Plant bases pinkish or purplish.

17. Summit of scape quite evidently flattened and broad relative to the spike (at least on living specimens); scape ridges few, usually 2 or 3, the 2 most prominent ones along the scape edges, therefore the upper scape narrowly ellipsoidal or fusiform in the cross-section; plants commonly of wet situations, sunny or shaded, in creek or river bottoms, titi swamps, cypress swamps, or rooted in muck of flowing water ditches, in fact almost always on fine-textured wet substrata; foliage of the plants smooth, a very deep, rich green, save for the reddish or purplish color of the leaf bases.

18. The two principal scape ridges noticeably and abruptly flattened and winglike below the spike and in the plane of the flattened scape, their combined width (on live specimens) broader than the scape, thus the outline of the cross-section of the scape bi-caudate (from N.J. north, the scape ridges become narrower); fruiting spikes seldom longer than 1.5 cm, ovoid, acute; seeds translucent, ovoid or ellipsoidal, seldom longer than 0.6 mm. 19. *X. difformis* var. *difformis*

18. The two principal scape ridges not abruptly flattened, the scape itself flattened and 2-edged and, in cross-section narrowly elliptic; fruiting spikes seldom shorter than 1.5 cm, broadly ellipsoidal or oblong, blunt; seeds farinose, dark when ripe, fusiform or narrowly oblong and never as short as 0.6 mm. (when this species is mixed with the above, as it often is, it is a noticeably larger, broader leaved and scaped plant). 17. *X. iridifolia*

17. Summit of scape not flattened and broad relative to the spike, the scape ridges usually more than 3 and therefore the upper scape broadly oval or almost round in outline (save for projecting ridges); habitats diverse, usually not alluvial; foliage pinkish or purplish-based but the surfaces, particularly of the outermost leaves papillose or tuberculate-scabrid.

19. Seeds farinose or very dark, thus opaque, mature spikes ovoid, acute; plants (save for depauperate specimens) seldom shorter than 2 dm; solitary or in small tufts; an entity of low, acid pine flatwoods and pine flatwoods ditches, but particularly on recently disturbed, acid moist sands of the lower terraces of the Coastal Plain, n. to N.C., west to eastern La. 21. *X. difformis* var. *floridana*

19. Seeds not farinose, translucent (save on extremely old herbarium specimens); mature plants seldom taller than 2 dm (sometimes taller in northern U.S.), usually in large tufts; mature spikes narrowly to broadly ellipsoidal or ovoid, blunt or acute. 20. *X. difformis* var. *curtissii*

16. Plant bases greenish, pale to dark brown, or stramineous.

20. Surfaces of leaves and scape roughened, the foliage therefore dull green, save for dark brown or charcoal colored dead leaf bases; ridges of the scape (1 spike length below spike) at least 4; lateral sepals lacerate, dark brown; seeds farinose; plants in pale or brown-based, rigid leaved tufts on very wet substrata, the scapes seldom a third longer than the longer leaves. 9. *X. serotina*

20. Surfaces of leaves and scape smoothish, the foliage therefore lustrous, and of a pale or deep green color; scape ridges rarely as many as 4, the upper scapes 2-edged.

21. The two primary scape ridges 1 spike length below a spike commonly flattened, often scabrous, in combination as broad as or broader than the scape (on living plants); perennial save in drought; leaves commonly spreading, the upper, nonclasping portion elliptic-linear; mature spikes ovoid to subglobose, blunt or acute; plants primarily of river swamps (often in shaded situations) of the coastal plain. 19. *X. difformis* var. *difformis*

21. The scape ridges not as above, hardly distinguishable from the somewhat flattened scape and certainly not, in combination, as broad as the upper scape; plants often annual, save in moistest warmest situations; leaves commonly ascending-linear; mature spikes narrowly ovoid to oblong, blunt; plants primarily of sunny disturbed situations or of sandy open swamps in the coastal plain; undoubtedly the most abundant *Xyris* of roadside ditches and comprising the weediest, most rapidly spreading species. 18. *X. jupicai*

1. **Xyris drummondii** Malme. Fig. 283

In large tufts, rarely solitary (these are usually seedlings), perennating by means of low-set lateral buds, the plant bases and often the leaf bases buried in a sandy substratum. Principal leaves broadly linear or linear-lanceolate, 3.0–8.0 (–10.0) cm long, 1.5–5.0 mm

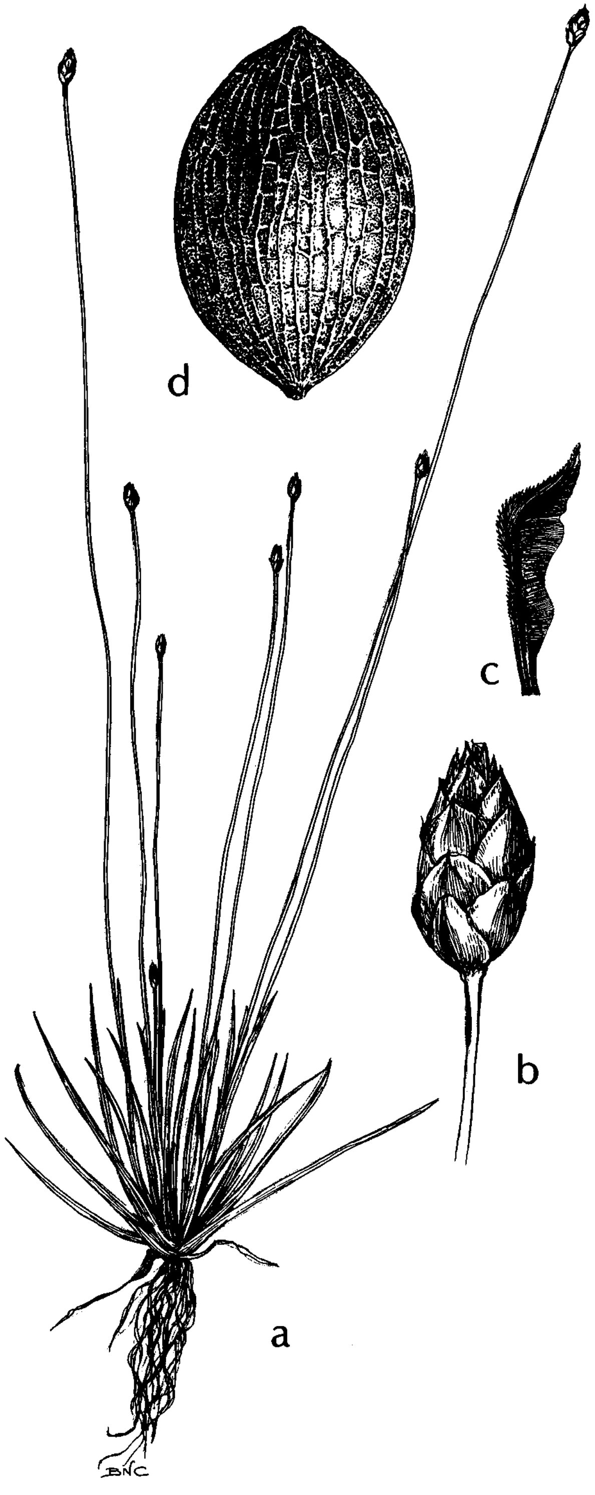

Fig. 283. **Xyris drummondii:** a, habit; b, head; c, lateral sepal; d, seed. (c, from Kral in *Sida* 2. 1966)

broad, flabellately spreading but not curvate, mostly a lustrous green, but toward the base becoming stramineous and at the very base marked with a conspicuous, dark brown or castaneous "patch." Apex of leaf acute but not curvate. Surface of leaf smooth or with low, short lines of papillae. Margin of blade above the equitant portion papillose or smooth. Sheaths of the scapes about as long as most of the leaves, tightly clasping the scape below, expanding about mid-way up into a narrow, bladelike structure, the margins joining at about 1.0 mm below the tip. Scapes linear-filiform, sometimes flexuous 4.0–20.0 cm long, terete and with many, low ribs below, flattened and 2-edged above. Spikes at seed bearing time lance-ovoid, of many, rather tightly imbricated bracts of which the lowest few are barren with elongate green dorsal areas. Fertile bracts suborbicular or broadly obovate, 4.0–5.0 mm long, definitely keeled, the apex rounded or obtuse, the exposed margin thin and subentire, the outer surface tan or pale brown with a narrowly elliptic, greenish, dorsal area nearly as long as the bract (on leaflike lowermost bracts, this dorsal area is sometimes prolonged into a pseudoblade). Lateral sepals included, broadly curvate, the sides broad, thin, brownish, the keel broad, thickened, a lustrous brown, evidently ciliate for most of its length. Petal blades obovate, about 3 mm long, unfolding in the morning. Seeds ellipsoidal, slightly longer than 0.3 mm, lustrous, translucent, with 18–20 fine, evenly spaced longitudinal lines and numerous faint cross-lines.

Low, moist acid sands or sandy peats or sphagnous peats of roadside ditches, pine flatwoods or disturbed lowlands. Coastal plain, s.e. Ga., n.w. Fla., s. Ala., s. Miss.

2. Xyris brevifolia Michx. Fig. 284

In large tufts, rarely solitary, perennating by means of low-set lateral buds. Principal leaves linear to linear-lanceolate, 2.0–5.5 (–7.0) cm long, 0.3–2.0 mm broad, the equitant portion from 1/4 to 2/3 the total leaf length, ascending to flabellately spreading, not curvate, often maroon, purplish, or pinkish during the overwintering or seedling stage, progressively browning and dying toward the centre of the plant as anthesis is reached, then passed, narrowing progressively from the greenish or brownish (sometimes slightly fibrous) equitant base to the acute, slightly incurved apex. Surface of leaf smooth or low-papillose. Margin of blade above the equitant portion incrassate, papillose or smooth. Sheath of the scape longer than the leaves, tightly clasping the scape below, expanding about mid-way up into a bladelike structure (which however is still equitant), the margins joining at from 1.0–3.0 mm below the tip. Scapes filiform, twisted but rarely flexuous, many-ribbed below, terete and one–many-ribbed above or sometimes slightly flattened and bicarinate just below the spike. Spikes at seed-bearing time globose (rarely ovoid) to depressed-globose or obovoid, 4.0–8.0 mm long, 4.0–7.0 mm broad, of comparatively few, rather loosely imbricated, bracts of which the lowermost are usually barren. Fertile bracts broadly obovate to suborbicular, 3.0–5.0 mm long, slightly or not at all keeled, the apex rounded, the exposed margin with a thin, narrow but conspicuous reddish or maroon, lacerate, sometimes squarrose, border, the outer surface at anthesis tan with a narrowly elliptic subapical, reddish brown dorsal area. Lateral sepals included, about the length of the subtending bract, linear, straight or slightly curvate, the sides narrow, thin, pale brown, the keel narrow, thickened, entire or papillate or rarely low-ciliate, a deep lustrous reddish brown. Petals with obovate blades, 2.5–3.0 mm long, unfolding in morning. Seeds ellipsoidal, 0.3–0.4 mm long, with 20–24 evenly distributed, low longitudinal lines, the cross-lines not evident.

Low, moist acid sands or sandy-peats of pine flatwoods, pineland pondshores, lakeshores or particularly abundant on disturbed sandy moist areas. Coastal plain, e. N.C. to s. Fla., Fla. Panhandle, s. Ala.; beyond our range into Carib. Is. and S.Am.

3. Xyris flabelliformis Chapm. Fig. 284

Solitary or in small tufts, perennating by means of low-set lateral buds or behaving as an annual. Principal leaves linear-lanceolate, (1.0–)2.0–3.0(–4.0) cm long, 1.0–3.0 (–4.0) mm broad, usually slightly curvate, the equitant portion from 1/3 to 1/2 the total leaf

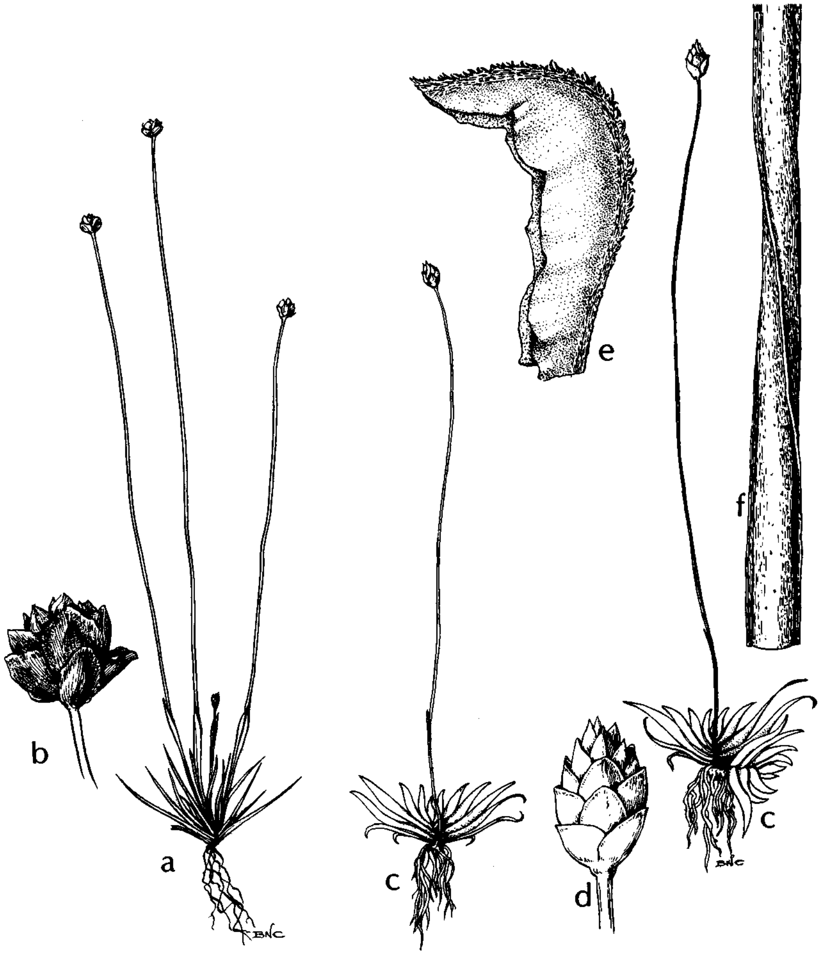
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Fig. 284. a–b, **Xyris brevifolia:** a, habit; b, head; c–f, **Xyris flabelliformis:** c, habit; d, head; e, lateral sepal; f, midsection of scape.

length, the surface of the leaf papillose in short transverse lines, often maroon, purplish, or pinkish during the overwintering of vegetative stage, progressively browning and dying toward the centre of the plant as anthesis is reached, then passed; margin of blade above the equitant portion slightly incrassate, papillose or finely tuberculate-scabrid. Sheath of the scape longer than the leaves, tightly clasping the scape below, expanding about mid-way up into a bladelike structure (which however is still equitant), the margins joining at about 1 mm beneath the tip. Scapes filiform, twisted, sometimes flexuous, many-ribbed below, terete and 4–many-ribbed above just below the spike. Spikes at seed-bearing time ovoid (rarely globose), 4.0–8.0 (rarely 10.0) mm long, 3.0–5.0 mm broad, of a comparatively few loosely imbricated bracts. Fertile bracts broadly obovate to suborbicular, 3.0–5.0 mm long, often low-keeled, the apex rounded or acute, the exposed margin entire or shallow erose, becoming somewhat lacerate with age, the outer surface at anthesis tan with an elliptic subapical, pale green, dorsal area but at fruiting time becoming a darker brown, the dorsal area inconspicuous or reddish brown. Lateral sepals included, usually about 1 mm shorter than the subtending bract, bent-curvate, the broad sides thin, lustrous, pale brown, the keel narrow, thickened-ciliate, and deep lustrous reddish brown. Petals with obovate blades, 2.5–3.0 mm long, unfolding in the morning. Seeds broadly ellipsoidal, 0.3 mm long with 20–24 evenly distributed longitudinal low ribs, the cross-lines not evident.

Low, moist acid sands or sandy-peats of pine flatwoods, pineland pondshores, lakeshores or particularly abundant on disturbed sandy moist areas. Lower terraces of the coastal plain, N.C. s. to pen. Fla., w., close to the Gulf coast to e. La.

4. **Xyris elliottii** Chapm. Fig. 285

In large tufts, the bases brownish, lustrous, perennating by means of pale, elongated, fleshy lateral buds. Principal leaves linear to narrowly linear (rarely filiform), 10–30 cm long, 1–2 (–2.5) mm broad, flat to slightly twisted; margins minutely tuberculate, incrassate, pale; surface above the equitant portion green or reddish green, smooth; tip acute to acuminate, slightly incurved; base hard, brown, abruptly but not broadly dilated, often persistent as chaffy fragments. Sheath of the scape shorter than the leaves, tight and lustrous brown toward the base, slightly looser toward the oblique, short-tipped, orifice. Scapes 40–60 (–70) cm long, slightly twisted, or straight, terete with one to several low ridges below, oval or somewhat flattened above in cross-section and smooth (or with up to four low ridges, the ridges minutely tuberculate). Spikes at seeding time ovoid to broadly elliptic, acute, 6–15 mm long, dull, sometimes appearing shaggy, with several closely imbricate bracts. Fertile bracts 5–6 mm long, obovate, shreddy at the apex at maturity, the surfaces pale to dark brown, dull, with gray-green, dull, oval or obovate, papillose dorsal areas. Lateral sepals included or slightly exserted, the keel increasingly ragged or ascending fimbriate toward the apex. Blades of petals obovate, ca. 5 mm long, yellow, opening in the morning. Seeds 0.5–0.6 mm long, ellipsoidal, translucent, with about 12 distinct, straight, longitudinal lines, the vertical lines faint, at irregular intervals.

Moist sands or sandy peats of savannas, pineland pond margins, lakeshore, and roadside ditches. Coastal plain, S.C. to Fla., w. near the Gulf coast to s. Miss.

5. **Xyris baldwiniana** Schultes in R. & S. Fig. 285

In large tufts, the leaf bases usually brownish, lustrous, (rarely pinkish, this usually on very wet sites), perennating by overwintering, fleshy, pale yellow buds. Leaves filiform to linear-filiform, 10–30 cm long, straight or slightly twisted, green, terete or oval, or blocky in the cross-section above the equitant portion, expanding more or less abruptly toward the lustrous base. Sheath of the scape from ½ as long to nearly as long as the principal leaves, tightly investing the scape save for the loose orifice and a short blade. Scape 20–40 (–50) cm long, usually broader than the leaf, terete below, one-ridged and tending to be terete above. Spikes at seed-bearing time ovoid or ellipsoidal, 4–7 mm

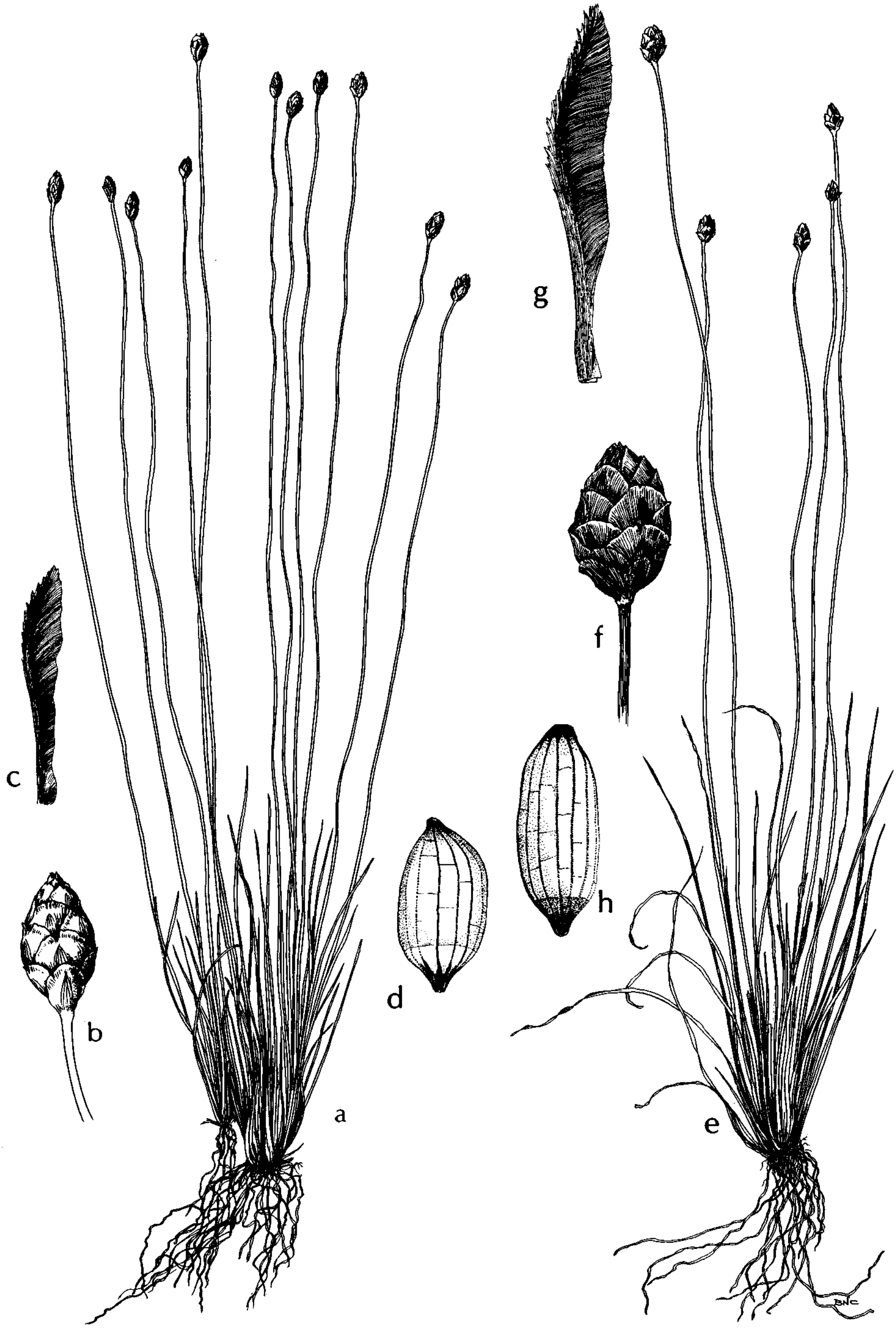

Fig. 285. a–d, **Xyris baldwiniana:** a, habit; b, head; c, lateral sepal; d, seed; e–h, **Xyris elliottii:** e, habit; f, head; g, lateral sepal; h, seed. (c, d, and g, h, from Kral in *Sida* 2. 1966)

long, acute or blunt, of a few, tightly imbricate bracts. Fertile bracts ovate to obovate, 4–5 mm long, not keeled, the apex rounded, the exposed margin entire, becoming erose with age, the matrix dull to dark brown or reddish brown, the dorsal area, elliptic, dull green. Lateral sepals included, slightly shorter than the bracts, linear but slightly curvate, reddish brown, the keel lacerate from the tip to about the middle or slightly beyond. Petal blades cuneate-obovate, ca. 3–4 mm long, unfolding in morning. Seeds oblong or narrowly ellipsoidal 0.8 mm to nearly 1 mm long, the longitudinal lines evident, the whole seed translucent, yellowish or pale amber.

Moist sands or sandy peats of pine flatwoods, hillside bogs, roadside ditches, and savannas. Coastal plain, N.C. to n. Fla., w. to e. Tex.

6. Xyris isoetifolia Kral. Fig. 286

In large tufts, the leaf bases usually brownish, lustrous, perennating by overwintering lateral buds. Leaves filiform to linear-filiform, somewhat flattened in the cross-section, 4.0–15.0 cm long, smooth, ascending, straight or slightly twisted, green above the equitant portion, pale or brownish below at the very expanded base. Sheath of the scape from half as long to nearly as long as the principal leaves, tightly investing the scape save for the loose orifice and short (2.0–4.0 mm) blade. Scape 15.0–30.0 cm long, very slightly twisted, occasionally flexuous, linear-filiform, ridgeless, oval or even terete in the cross-section above. Spikes at seed-bearing time ellipsoidal to obovoid, 5.0–7.0 mm long, of few, rather loosely imbricated, bracts. Fertile bracts broadly oblong to obovate, the longer about 4.5 mm, not keeled, the apex rounded, the exposed margin subentire or erose with age, the matrix scarious and pale brown, the dorsal area narrowly to broadly elliptic, pale green. Lateral sepals included, ca. 4.0 mm long, linear-curvate, reddish brown, the keel ciliate. Petal blades obovate, ca. 4 mm long, opening in the morning. Seeds ellipsoidal, slightly less than 0.5 mm long, translucent, the 12–14 longitudinal lines distinct and straight, the horizontal lines much fainter.

Moist sands or sandy-peat of savanna bogs, flatwoods pond margins and lakeshores. Fla. Panhandle (Bay and Gulf counties).

7. Xyris ambigua Beyr. ex Kunth.

Solitary or in small tufts, the base hard, often fibrous, perennating by both terminal and lateral overwintering buds. Leaves broadly linear, spreading, 10.0–40.0 cm long, 0.3–2.0 cm broad (tending to be more ascending and linear-leaved on heavier soils), a dark and lustrous green above the equitant portion (ca. ⅔ the total leaf length), the basal equitant portion stramineous, brownish, or pinkish, narrowing more or less gradually to an abrupt, slightly incurved, tip. Surface of the leaves smooth or slightly papillose; margin of the leaves papillose, rarely harshly scabrous. Sheath of the scape from ⅓ to nearly as long as the principal leaves, rather loosely investing the scape save for a distal, bladelike portion, the margins of which converge to form a short (ca. 2 mm) tip; bases of the sheaths usually lustrous, stramineous to castaneous. Scape (15–) 70–100 cm long, twisted but rarely flexuous, many-ribbed below, becoming flattened and 2-edged above. Spikes at seed bearing time ellipsoidal to lance-ovoid, 1.0–3.0 cm long, of many tightly imbricated bracts. Fertile bracts broadly obovate or suborbicular, 5.0–8.0 mm long, not keeled, the apex rounded, the exposed margin subentire or erose with age, the matrix reddish brown or pale brown, the dorsal area roughly rectangular, olive to dark brown. Lateral sepals included, curvate, a dark lustrous brown, the thickened keel nearly as broad as the sepal sides, ciliate-scabrid. Petal blades yellow, obovate, ca. 8 mm long, unfolding in morning. Seeds ellipsoidal to broadly ovoid, caudate at one end, 0.5–0.6 mm long, lustrous with 20–22 distinct, papillose longitudinal lines and several faint cross lines.

Moist sands or sandy-peats of bog margins, savannas, pine flatwoods, lakeshores and roadside ditches. Coastal plain, Va., s. into Fla., w. to e. Tex.

8. Xyris stricta Chapm. Fig. 287

Tufted, usually in large, rigid-leaved, clumps, whose brown, fibrous bases are set on

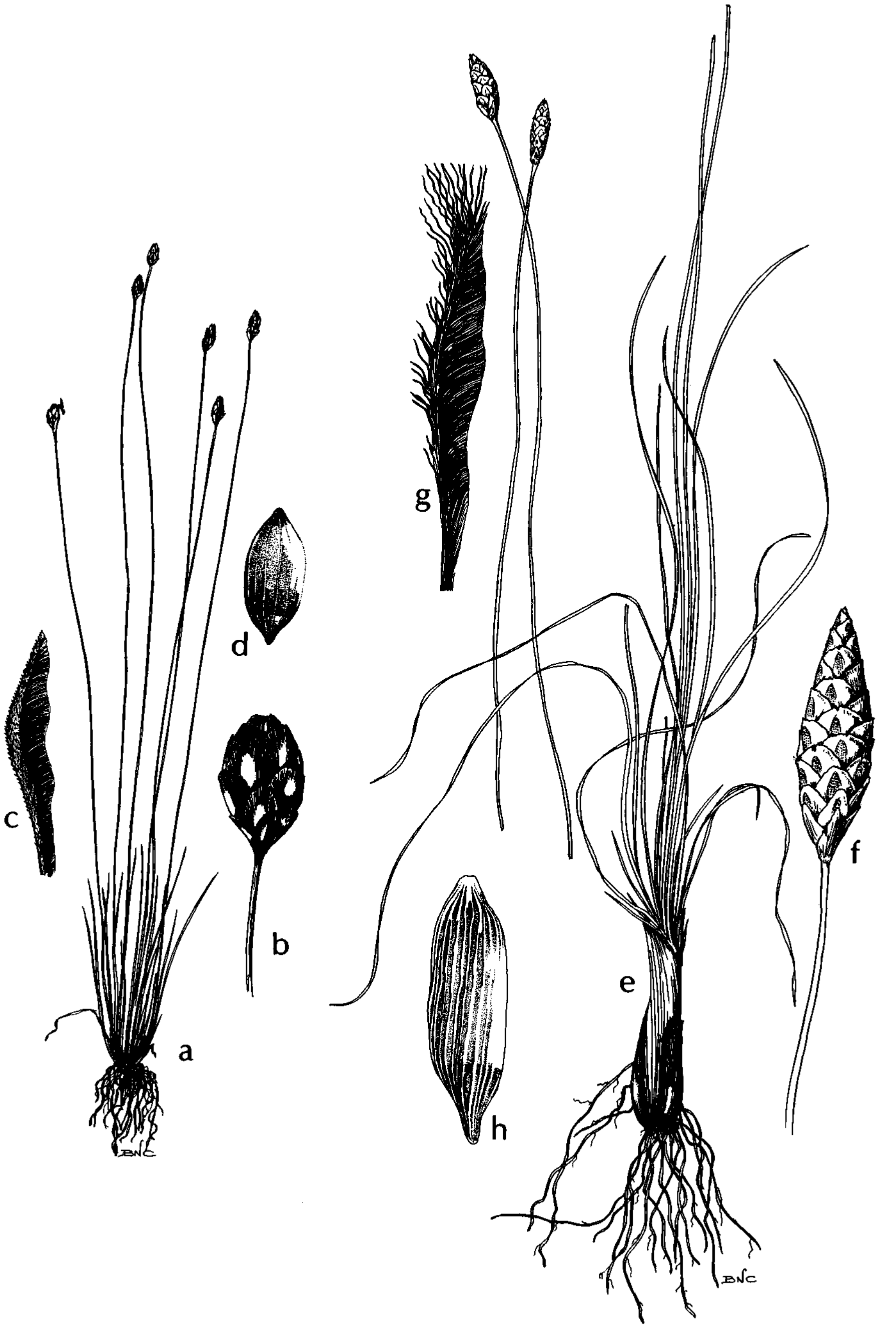
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Fig. 286. a–d, **Xyris isoetifolia:** a, habit; b, head; c, lateral sepal; d, seed; e–h, **Xyris caroliniana:** e, habit; f, head; g, lateral sepal; h, seed. (c, d, g, h, from Kral in *Sida* 2. 1966)

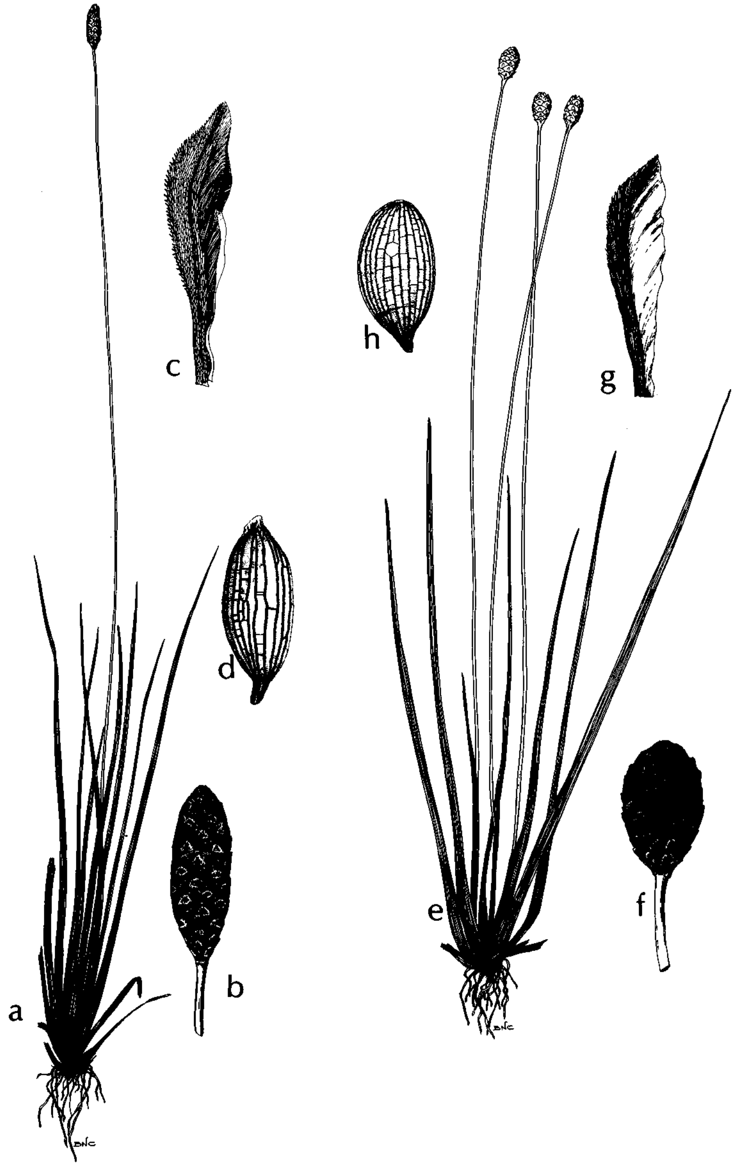
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Fig. 287. a–d, **Xyris stricta:** a, habit; b, head; c, lateral sepal; d, seed; e–h, **Xyris serotina:** e, habit; f, head; g, lateral sepal; h, seed. (c, d, g, h, from Kral in *Sida* 2. 1966) muck or wet sand in shallow water. Leaves narrowly linear, (15–) 20–50 cm long, 2–5 mm broad, gradually tapering to a slender, incurved tip, green above the equitant portion (rarely maroon), but reddish brown or maroon toward the base (old leaves are very often persistent as brown, almost black scales or shreds); margins tuberculate or papillate, incrassate; surfaces smooth, very rarely papillate. Sheath of the scape shorter than the leaves, tight and brownish or castaneous below, becoming maroon or green toward the oblique, short-bladed orifice. Scapes linear, (40–) 45–85 cm long, roundish toward the base, with a few low, tuberculate, spiral ridges, definitely flattened above toward the spike, the two marginal ridges papillate or tuberculate, sometimes accompanied by 2–4 lower ridges between the margins. Spikes oblong, narrowly ellipsoidal or lance-ovoid, 1.0–2.0 (–2.5) cm long, blunt, of very many, tightly imbricate scales. Fertile bracts suborbicular, ca. 5–6 mm long, the outer surface castaneous save for the greenish, rectangular dorsal area, the margins entire. Lateral sepals curvate, about the length of the bracts, a lustrous reddish brown, the wings broad and thin, the keel thicker and ciliate from base to apex. Blades of petals cuneate 3.0–3.5 mm long, yellow, unfolding in the late morning, closing in the early afternoon. Seeds ellipsoidal, ca. 0.8 mm long, caudate at one end, opaque, with 18–20 longitudinal rows of dark, contiguous papillae and somewhat less distinct, irregularly disposed cross-lines, all imparting a dark color to the seed which may also be farinose.

Wet sandy peat, sandy clay, peat muck, or alluvium, often with the bases submersed, cypress flats, roadside ditches, pineland ponds. Coastal plain, S.C. to n. Fla., w. to s. Miss.

9. Xyris serotina Chapm. Fig. 287

Tufted, usually in large, dark brown or charcoal-based clumps of spreading-leaved plants, the bases of which are set on muck or wet sand and in shallow water. Leaves broadly linear, 20–50 cm long, 3–12 mm broad, stiff, dull green, broadening gradually from the incurved tip to a pale green, pale brown or stramineous base (old leaves very often persist as dark gray-brown scales); margins tuberculate, scabrid, incrassate; surfaces, particularly of outer leaves tuberculate scabrid in short, diagonal lines. Sheath of the scape much shorter than the leaves, tight and lustrous brown below, looser above and with a broadly expanded, bladelike orifice, which terminates in a short, cusplike blade. Scapes linear, 24–60 cm long, straight usually not much longer than the longer leaves, several-angled below, the angles ridged, scabrous, becoming somewhat flattened above, the two most prominent scabrous ridges comprising the edges, with from 1 to 6 additional but less conspicuous ridges. Spikes ovoid or broadly ellipsoidal, 1.0–1.8 cm long, acute or blunt, of several tightly imbricated bracts, the lower ones barren. Fertile bracts suborbicular, reniform or broadly obovate, 5–7 mm long, entire (save in age), the outer surface a dull brown, the dorsal area deltoid, greenish, greenish brown, or reddish brown. Lateral sepals slightly curvate, linear, about the length of the bracts, dark brown, the thin keel lacerate from at least the middle to the apex. Blades of petals cuneate, 3.0–3.5 mm long, yellow, unfolding in the late morning, closing in the early afternoon. Seeds ellipsoidal, ca. 0.6 mm long, caudate, opaque and farinose, with 20–24 dark, longitudinal lines of contiguous papillae and several, slightly less conspicuous, less regular, cross-lines.

Wet sandy peat, sandy clay, peat-muck, or alluvium, often with the bases in shallow water, cypress flatwoods, roadside ditches, pineland pond edges. Coastal plain, N.C. to n. Fla., w. to s. Miss.

10. Xyris caroliniana Walt. Fig. 286

Solitary or in small tufts, the bases deeply set in the substrate, perennating by means of pale, elongated, fleshy lateral buds. Outer leaves scaly, castaneous; principal leaves linear, 20–50 cm long, 2–5 mm broad, twisted and flexuous, fleshy, minutely tuberculate along the margins, otherwise smooth and lustrous; tip blunt to acute; base abruptly dilated, dark brown, shiny, long-persistent as scales. Sheath of the scape shorter than the leaves, tight below, loose toward the oblique orifice which is tipped by a short (2–4 mm) blade. Scapes linear, 50–110 cm long, twisted, flexuous, smooth, terete and minutely ridged below, becoming oval in cross-section and smooth to 1-ridged above, the ridges if present minutely tuberculate. Spikes (1.3–) 1.5–3.0 cm long, elliptic to narrowly oblanceolate in outline, blunt to broadly acute, of few to many closely imbricate bracts. Fertile bracts 0.5–1.0 (–1.3) cm long, oblong to obovate, entire or emarginate, becoming erose, the matrix reddish brown to tan with an elliptic or rectangular gray-green or brown dorsal area. Lateral sepals linear, slightly to conspicuously exserted, tan to reddish brown with a broad keel which is entire below but fimbriate at its exserted apex. Petal blades obovate, 8–9 mm long, yellow or white, in most populations opening in the afternoon. Seeds fusiform, narrow, 0.8–1.0 mm long, translucent, with about 20 pale, stripelike longitudinal lines, the vertical lines not evident. (*X. flexuosa* Muhl. ex Ell.; *X. arenicola* Small)

Moist sands of pine flatwoods or savannas, well-drained sands or lower reaches of scrub oak-pine barrens. Coastal plain, N.J. to Fla., w. to Tex.

X. caroliniana has long been confused with another bulbous-based *Xyris, X. torta.* The differences between these two Xyrids are as follows: (1) *X. caroliniana* (*flexuosa*) is a plant primarily of the lower terraces of the Atlantic and Gulf coastal plain while *X. torta* is primarily in the interior or North Atlantic provinces save west of the Mississippi River; the former is on drier soils, while the latter is on wet, often sphagnous, substrates. (2) *X. caroliniana* has deepset, very broad and castaneous, leaf bases in contrast to smaller, more shallowly set leaf bases of *X. torta.* (3) *X. caroliniana* has narrower, usually longer, spikes and exserted lateral sepals in contrast to the shorter, broader spikes of *X. torta* whose lateral sepals are included. (4) The lateral sepals of *X. caroliniana* are almost linear, the keel very long-fimbriate toward its apex, while the sepals of *X. torta* are very curvate with keels ciliate from the base to the apex which bears a small tuft of fimbriae. (5) The bracts of *X. caroliniana* lack the apical tuft of short hairs present on the apex of the bracts of *X. torta.* (6) The seed of *X. caroliniana* are narrowly oblong, almost twice as long as the plump seed of *X. torta.* (7) *X. caroliniana* flowers later in the season than does *X. torta.* (8) *X. caroliniana* usually opens its flowers in afternoon; *X. torta* flowers in the morning.

11. Xyris platylepis Chapm. Fig. 288

Solitary or in small tufts, the bases shallowly set on the substrate, perennating by means of pale, fleshy, lateral buds. Outer leaves scaly, pinkish, becoming a dull gray-brown; principal leaves linear, 20–40 (–50) cm long, 5–10 mm broad, twisted, ascending, flexuous, fleshy, minutely tuberculate or smooth along the margin, otherwise smooth; tip blunt to acute; equitant portion dilated, fleshy, ivory white or pink or purplish toward the base. Sheath of the scape shorter than the leaves, castaneous or a paler brown and tight toward the base, looser toward the oblique, short-bladed orifice. Scapes 50–110 cm long, twisted, flexuous, smooth to minutely ridged and terete below, oval in the cross-section and smooth to 1-ridged above, the ridges, if present, papillate. Spikes elliptic to ovoid or oblong, 1.5–3.0 (–4.0) cm long, of numerous, closely imbricate bracts. Fertile bracts obovate, 5–7 mm long, entire (becoming slightly erose with age), brownish or pale tan with an oblong to deltoid, dark green dorsal area. Lateral sepals included, light brown, about the length of the subtending bracts, linear, the keel narrow save toward the apex where it is lacerate. Blades of the petals broadly obovate, about 5 mm long, yellow or white, opening in the afternoon. Seeds ellipsoidal, about 0.5–0.6 mm long, translucent, with 10–12 rather irregularly longitudinal lines together with a scattering of less distinct vertical lines.

Moist to wet sands or sandy peats of pineland pond margins, savannas, bogs, and roadside ditches. Coastal plain, Va. to s. Fla., w. to cen. La.

This species, because of its colored, fleshy, and scalelike leaf bases could be confused with *X. torta* or *X. scabrifolia.* From the former it is distinguished by its lacerate sepal keels, from the latter by its smaller seed and its smooth leaf and scape surfaces.

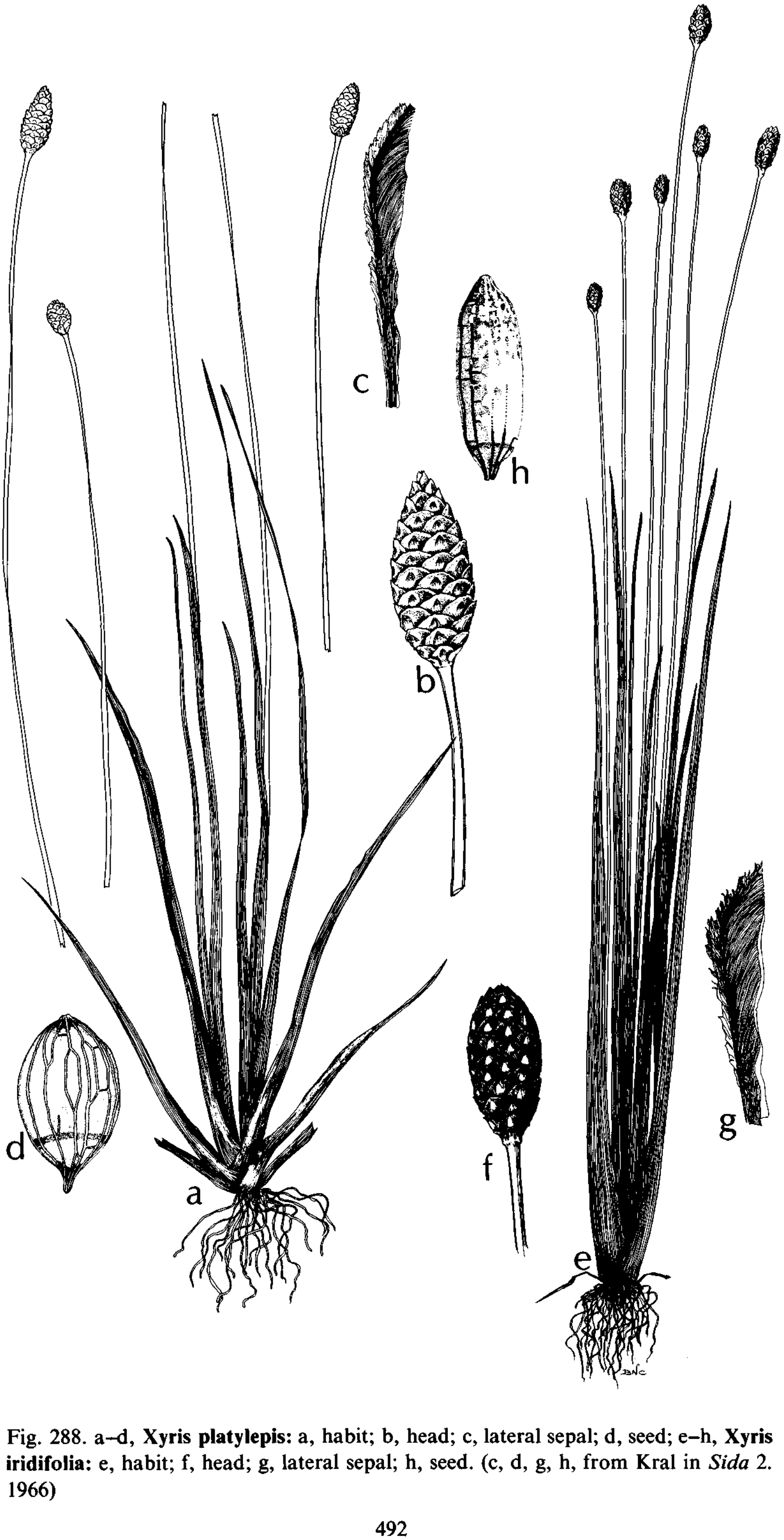

Fig. 288. a–d, **Xyris platylepis:** a, habit; b, head; c, lateral sepal; d, seed; e–h, **Xyris iridifolia:** e, habit; f, head; g, lateral sepal; h, seed. (c, d, g, h, from Kral in *Sida* 2. 1966)

Xyris platylepis is seldom found with its bases in water; rather, it is found with such species as *X. ambigua, X. flabelliformis, X. brevifolia,* on moist sites which are seldom if ever inundated. It is a rather weedy species, being quick to occupy moist sands of bulldozed pine flatwoods, or areas which have been heavily logged, or sandy seepage areas along roads. In such places its reproduction may form a turf, the rosettes maroon and curvate-leaved, thus strongly resembling *X. flabelliformis.*

12. **Xyris scabrifolia** Harper. Fig. 289

Solitary, or in very small tufts, bulbous-based, the bases shallowly set on the substratum, perennating by elongate, fleshy, corn-colored, lateral buds. Outer leaves scaly, pinkish, later brown; principal leaves linear, 10–40 cm long, 5–10 mm broad, twisted, striate-scabrid throughout, the blades dull green, the equitant portion fleshy and pinkish, later brownish and fibrous. Sheath of the scape shorter than the leaves, tight below, and castaneous, looser and greenish above toward the oblique orifice which is tipped by a short blade. Scapes linear, 30–60 cm long, twisted and sometimes flexuous, terete and multicarinate toward the base, 2 to 4 ridged above, striate-tuberculate throughout, but particularly harsh on the ridges. Spikes 10–20 mm long, obovoid, or ellipsoidal, of many tightly imbricate bracts. Fertile bracts 6–8 mm long, obovate, subentire, tan with a broadly elliptic or rhombic gray-green dorsal area, becoming somewhat erose, dark reddish brown with a red-brown dorsal area. Lateral sepals included, linear, about the length of the subtending bracts, brown, the margin of the narrow keel lacerate below, fimbriate toward the apex. Blades of petals ca. 5 mm long, suborbicular, yellow, opening in the afternoon. Seeds oblong to ellipsoidal from 0.6 mm to nearly 1.0 mm long, caudate, translucent, with 12–14 distinct, smoothish longitudinal lines and scattered, indistinct, irregularly disposed vertical lines.

Moist to wet sandy peats of acid sphagnous bogs or sandy seepage areas in the pinelands. Cen. Ga.; Fla. Panhandle.

Remarks. This is unquestionably the rarest entity of *Xyris* in the southeastern United States, being known only from a few scattered localities in northwest Florida and only from the type locality in Georgia. In fact, it has not been again collected from the type locality. The species with which it is associated are *X. caroliniana, X. ambigua, X. baldwiniana, X. drummondii*; however it most closely resembles *X. platylepis,* a far commoner plant with similarly pink, fleshy, bulbous bases and twisted scapes, being distinguishable from it primarily by its scabrousness, its much longer, more oblong-and-caudate seeds, and its generally lower stature.

13. **Xyris torta** J. E. Sm. in Rees.

Solitary or in tufts of a few individuals, bulbous-based, perennating by pairs of stout, fleshy, lateral buds which arise from two of the innermost leaf axils. Leaves of two sorts, the outer scalelike (from the bud scales), the inner elongate-linear. Principal leaves linear, ascending, 20–50 cm long, 2–5 mm wide, twisted, grooved longitudinally, the upper (blade) portion dark green, lustrous, narrowing rather abruptly to a blunt, incurved, thickened tip, the equitant portion pinkish, purplish, or yellow green, flaring rather abruptly to the fleshy, pale or castaneous base. Leaf surfaces smooth or papillose; leaf margins narrowly incrassate, smooth or papillose. (Outer leaves are usually much shorter than the inner, are maroon or more commonly a dark, lustrous brown, are often scalelike with very dilated bases and slender, often acuminate, tips.) Sheath of the scape shorter than the principal leaves, tightly clasping the scapes below, becoming looser toward the orifice which has a short, erect, slightly divergent blade at its tip. Scapes 15.0–80.0 (–100) cm long, 1.0–1.5 (–2.0) mm broad, slightly to very twisted and flexuous and many-ridged below, 2–4 (–6) ridged above and somewhat flattened above toward the spike. Spikes at seeding time broadly ovoid or ellipsoidal to lance-ovoid or rarely oblong, 0.8–2.5 cm long, 0.6–1.0 cm broad, of many, tightly imbricated bracts. Fertile bracts broadly obovate to suborbicular, 5.0–7.0 mm long, a deep lustrous brown within, a dull brown on the outer surface save for a pale, gray-green, elliptical, subapical dorsal

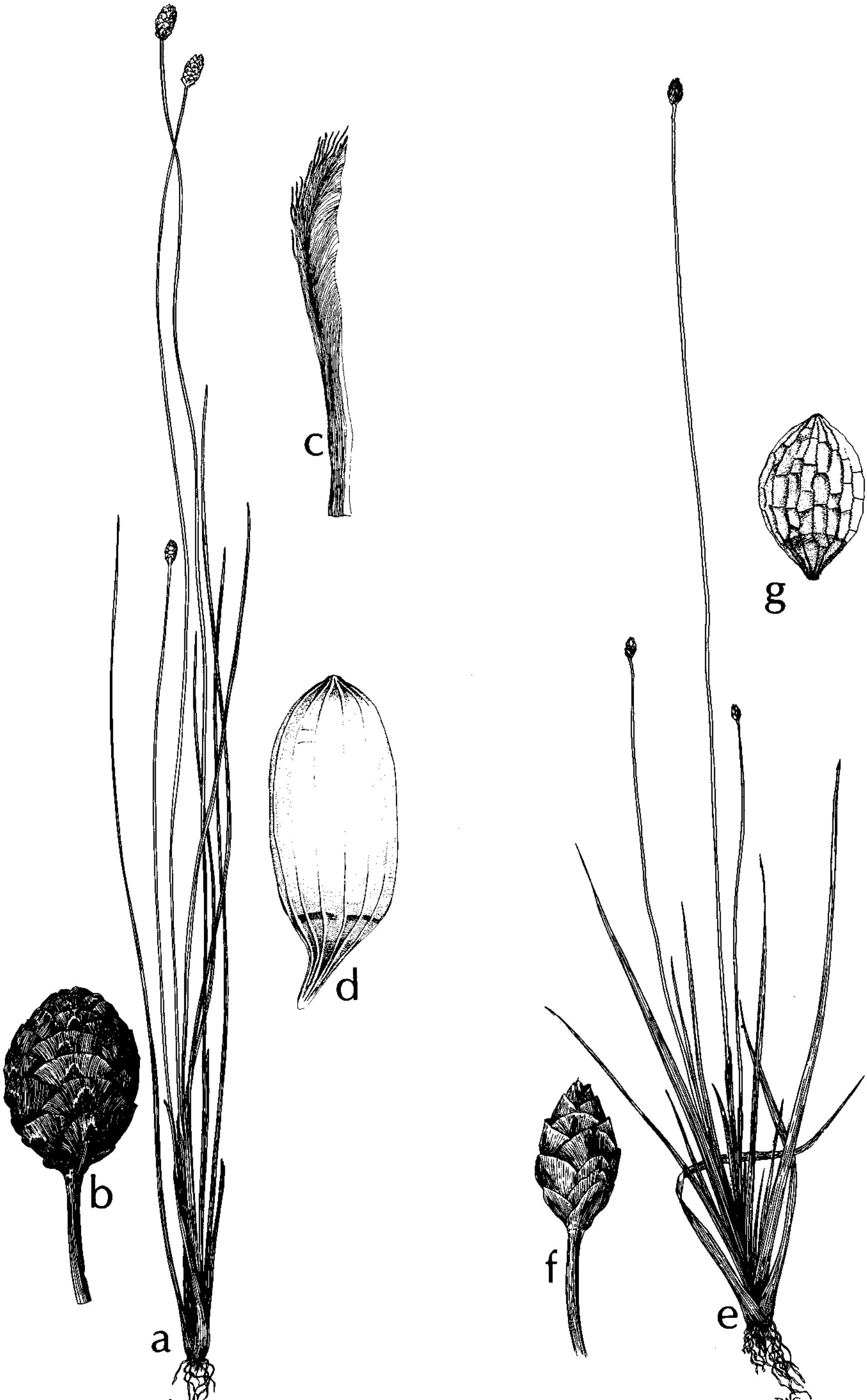

Fig. 289. a–d, **Xyris scabrifolia:** a, habit; b, head; c, lateral sepal; d, seed; e–g, **Xyris difformis** *var.* **floridana:** e, habit; f, head; g, seed. (c, d, g, from Kral in *Sida* 2. 1966)

area; exposed margin of the bract entire or sparingly ciliate save for a short-fimbriate, usually slightly emarginate, apex. Lateral sepals included, slightly shorter than the subtending bract, a lustrous brown, lunate, the broad, thickened keel ciliate-scabrid from near the base to the apex where appears a small tuft of reddish brown or blonde trichomes. Blades of petals obovate, ca. 4 mm long, unfolding in the morning. Seeds ellipsoidal, ca. 0.5 mm long, caudate, with 14–18 prominent longitudinal lines (these under high magnification a series of contiguous papillae) and indistinct, narrower, cross-lines, translucent save for the region of the embryo.

Sphagnous bogs, streambanks, lake and pondshores, wet sandy swales, and acid sandy swamps. Primarily above the coastal plain, from the Canadian Shield w. to the limit of the coniferous forest, s. in the Atlantic States to piedmont of Ga., thence to Tex. and Okla.

14. Xyris fimbriata Ell. Fig. 290

Solitary or in small tufts, perennating by means of low-set lateral buds (these therefore usually buried in and overwintering in a mucky substratum). Principal leaves ascending linear, 4.0–70.0 cm long, 0.5–2.5 cm broad, flat or slightly twisted, ascending, the upper part green, lustrous, becoming pale green, stramineous or even pinkish toward the base, narrowing progressively from the broad, sheathing equitant portion to the acute, slightly incurved apex, the equitant portion not more than ⅙ the total leaf length. Surface of the leaf smooth; margin of the blade papillose. Sheath of the scape shorter than the fully developed leaves, (15–40 cm long), short bladed, rather loose above. Scapes linear 80–150 cm long, twisted and multicarinate below, flattened and 2–3-ridged (–4-ridged) above, the ridges tuberculate-scabrid. Spikes at seed bearing time ellipsoidal to short-oblong, less commonly ovoid, 1.2–2.5 cm long, of many, rather tightly imbricated bracts, the lowest barren. Fertile bracts broadly obovate to suborbicular, 5.0–8.0 mm long, not keeled, the apex rounded, the exposed margin subentire, the other surface tan or dull brown with a broadly ovate or triangular, silvery green or pale green subapical dorsal area about ½ the length of the bract. Lateral sepals prominently exserted, linear-cuneate, the broad sides thin, a pale lustrous yellow-brown, the keel slightly thickened, a darker brown, broad, the margin long-fimbriate, particularly toward its apex. Blades of petals 5–6 mm long, obovate, opening in the morning. Seeds narrowly fusiform or oblong, 0.8–1.0 mm long, pale but lustrous, with about 12 broad, pale, flattened, longitudinal, wavy lines which are nearly as broad as the intervals.

Sand, sandy-peat, sandy-muck or peat-muck of pineland pools, cypress ponds, river and streambanks, lakeshores, ditches and swamps. Coastal plain, N.J. s. to s. Fla., w. along the Gulf coast to La.

X. fimbriata is one of the few of our *Xyris* which is very quickly distinguishable from the others; its scape ridges are always harsh to the touch, its spikes are dull and appear fuzzy from the numbers of exserted, fimbriate, lateral sepals, and its very tall, willowy appearance makes it easily distinguishable from a distance. A testimonial to the ease with which it may be identified is in its singularly uncomplicated nomenclature.

15. Xyris smalliana Nash. Fig. 290

Solitary or in small tufts, perennating by pairs of lateral buds whose scales quickly become green, elongate. Principal leaves linear (19–)30–50(–60) cm long, 0.5–1.5 cm broad, usually pinkish, sometimes pale green toward the base, the rest of the leaf a deep lustrous green, flat or slightly twisted, and more or less evenly tapering to a slightly incurved acute tip. Sheath of the scape shorter than the leaves, the oblique orifice terminating in a cusplike blade. Scapes 50–150 cm long, terete and very low ribbed below, 1–2 ridged and somewhat flattened toward the spike, smooth. Spikes 1–2 cm long (rarely to 2.5 cm), ellipsoidal or narrowly ovoid, of many, closely imbricated bracts. Fertile bracts 5–8 mm long, ovate, entire, the matrix a lustrous brown, the dorsal area gray-green, elliptic. Lateral sepals slightly to conspicuously exserted, pale brown, the keel lacerate toward its apex, entire below. Blades of petals obovate, 5–6 mm long,

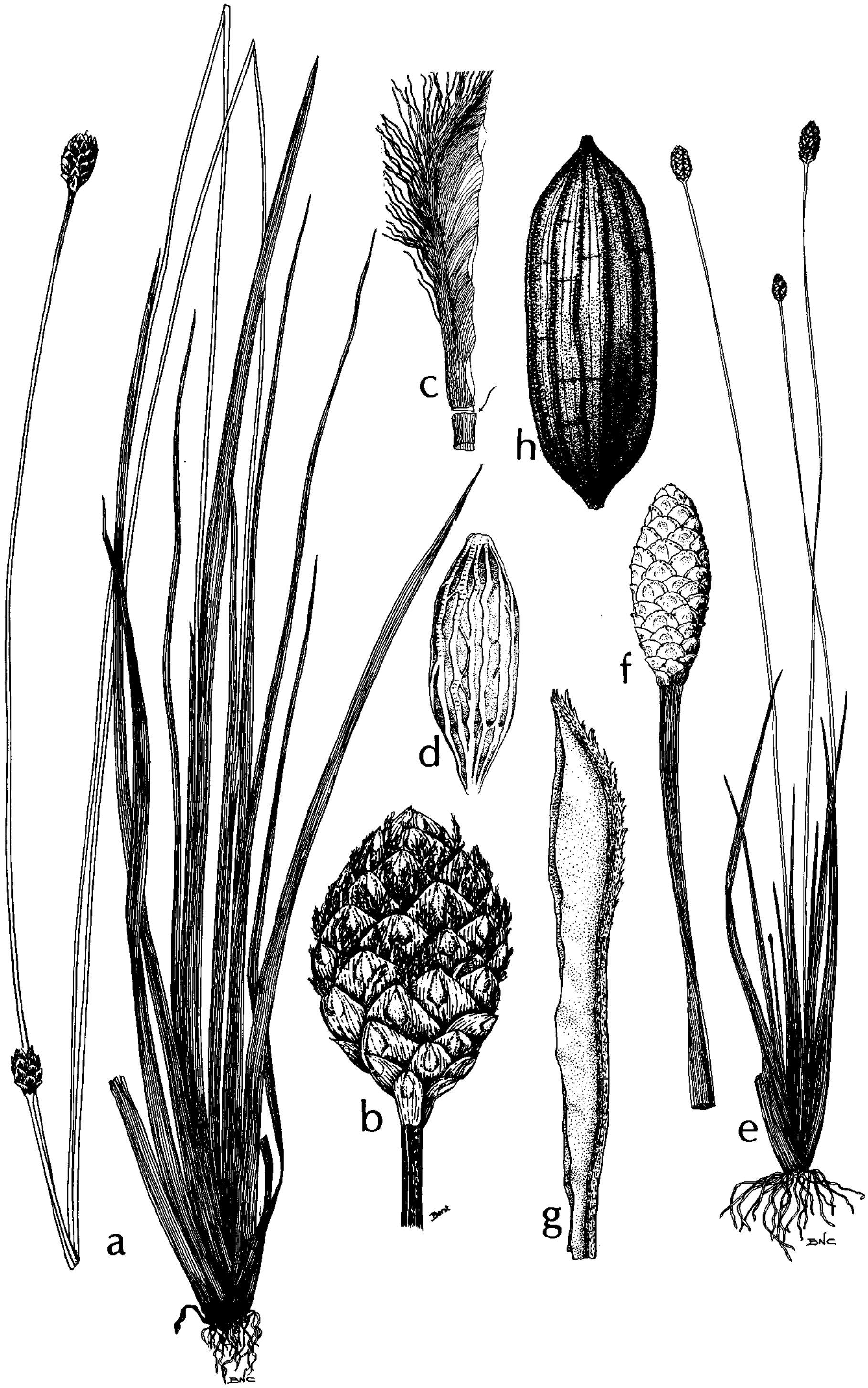
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Fig. 290. a–d, **Xyris fimbriata:** a, habit; b, head; c, lateral sepal; d, seed; e–h, **Xyris smalliana:** e, habit; f, head; g, lateral sepal; h, seed. (c, d, from Kral in *Sida* 2. 1966) yellow, unfolding in the afternoon. Seeds narrowly ellipsoidal to ovoid, 0.7 mm long or somewhat longer, the longitudinal ribs few, often irregular; cross-lines evident, irregularly distributed.

Sands, sandy peats, peat-mucks of pineland pools, roadside ditches, riverbanks, ponds, cypress ponds and lakeshores. Primarily not far from the seacoast, Maine to pen. Fla., w. in the Gulf coastal plain to Miss.

This tall *Xyris* is most often in association with *X. fimbriata* and *X. jupicai* throughout its range, but does not appear to get as far inland. It is quickly discernible from the former by its smooth scape edges (in contrast to the scabrous ones of *X. fimbriata*) and from the latter by its exserted sepals and larger seed.

16. Xyris longisepala Kral. Fig. 291

Solitary or in small tufts, smooth. Leaf linear (6.0–) 8.0–25.0 cm long, 1.0–2.0 mm broad, acute, (in drying indistinctly nerved, the marginal nerves thickened and pale-cartilaginous) pinkish or pale brown or greenish below, a dull green above, sometimes with some reddish brown streaks of pigmentation. Scape (30.0–)40.0–80.0(–82.5) cm long, 0.7–1.0 mm broad (measured at 1 spike length below the spike base), twisted but not flexuous, terete and many-ridged below, somewhat flattened in the cross-section and 1-ridged above. Sheath of the scape 5.0–15.5 cm long, dilated above, but narrowing to very short, cusplike blades. Spikes ellipsoidal to oblong, 1.0–1.6 cm long, 0.5–0.8 cm thick, blunt, of many somewhat loosely imbricated bracts. Fertile bracts broadly oblong, 4.0–6.0 mm long approximately 3.0 mm broad, at anthesis entire, in fruit somewhat erose, tan with a pale greenish or reddish brown dorsal area. Lateral sepal linear-curvate, approximately 0.5–1.0 mm longer than the subtending bract, the keel lacerate-fimbriate or somewhat ciliate for ⅔ of its length toward the summit where the fimbriae are longest. Blades of petals obovate, ca. 3.5 mm long, opening in the afternoon. Seeds ellipsoidal, about 0.4–0.5 mm long with about 12 prominent longitudinal nerves and several slightly less distinct cross-lines.

Moist to wet sandy shores of limesink lakes and ponds. Fla. Panhandle, s.e. Ala.

Ecology and Identification. X. longisepala, together with *Rhexia salicifolia* and *Hypericum lissophloeus,* appears to be confined in distribution to the rash of sinkhole ponds and lakes so characteristic of the karst topography of northwestern Florida. It is particularly abundant during low-water periods, when large expanses of almost pure sand are exposed along the lake margins. Here it may be in association with *X. smalliana* or *X. jupicai* or both, together with another new species of *Xyris, X. isoetifolia.*

It is immediately distinguishable from *Xyris jupicai* in that its flowers open in the afternoon, at a time when those of the latter are closed. However *X. smalliana* flowers are open at the same time of day and plants of that species bear many resemblances to this newly described one. Essentially the differences are in the lower stature, the different spike shape, the character of the keel of the lateral sepal, the smaller petals, and especially the smaller seed with its regularly ridged testum.

17. Xyris iridifolia Chapm. Fig. 288

Solitary or in small tufts, the pinkish or purplish, keeled, bases shallowly set on a mucky substratum, perennating by means of lateral, overwintering shoots. Leaves linear, iridiform, 40–70 cm long, 10–25 mm broad, flat or slightly twisted, smooth, and a deep, rich green tip broadly acute to blunt, incurved; base slightly dilated, keeled, pink or pale maroon, with a broadly hyaline margin. Sheath of the scape shorter than the leaves, deep brown or reddish brown and tight below, becoming somewhat looser and green above, the oblique orifice with a short cusplike blade. Scapes 60–80 cm tall, linear, straight or slightly twisted, terete and 2-ridged below, conspicuously broadened and flattened above, the edges smooth. Spikes oblong to broadly oblanceolate, rarely ovoid, 2.0–3.5 cm long, blunt, of very many, closely imbricate bracts, the lower ones barren. Fertile bracts 6–7 mm long, broadly obovate to suborbicular, entire, the outer surfaces dark purplish or reddish brown, shining save for a paler green or gray-green oval or

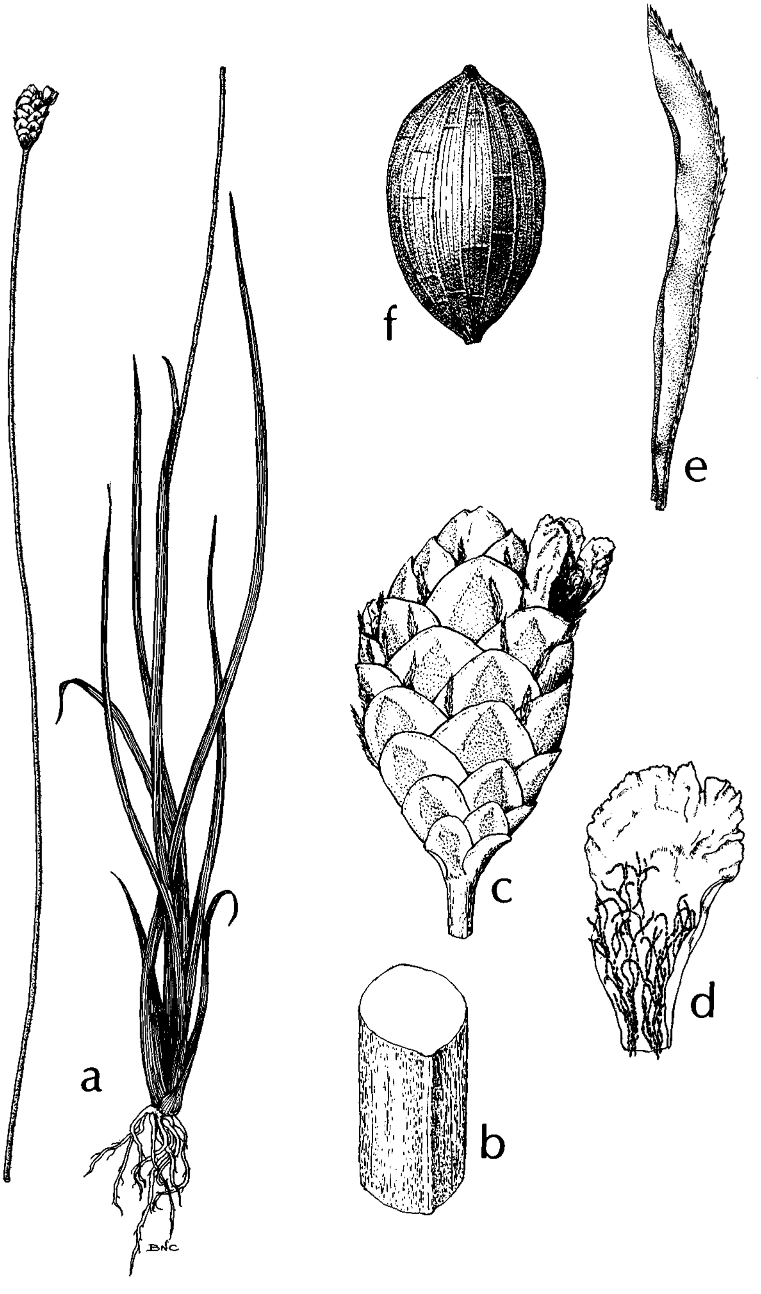

Fig. 291. **Xyris longisepala:** a, habit; b, section of scape; c, head; d, petal; e, lateral sepal; f, seed.

triangular dorsal area. Lateral sepals included, linear, about the length of the bracts, castaneous, with a broad, lacerate keel. Blades of the petals cuneate, ca. 3 mm long, yellow, opening in the morning. Seeds oblong-fusiform, 0.8–1.0 mm long, opaque, dark, farinose, the regularly arranged longitudinal lines obscured by the farina.

Wet sands, but more commonly wet sandy clay, sandy peat or peat muck or alluvium of stream banks, cypress swamps, marshes or pineland pond margins, the bases commonly submersed. Coastal plain, s.e. Va. to n. Fla., w. to e. Tex.

Xyris iridifolia shares the characteristic of farinose seed with three other entities of *Xyris,* namely *X. serotina, X. difformis* var. *floridana,* and *X. stricta;* it is usually in the same area with all of these in the southeastern coastal plain. However, *X. serotina* lacks the purplish leaf bases and has a much smaller spike; *X. difformis* var. *floridana* is a much more slender plant with a much smaller spike and seed; *X. stricta* has much narrower leaves and the keels of its lateral sepals are ciliate.

18. Xyris jupicai L. C. Rich. Fig. 292

Short lived perennial, solitary or in small tufts, dying completely after one year from seed or perennating from bulbous lateral overwintering buds. Leaves linear, 10–60 cm long, 5–10 mm broad, ascending, lustrous, yellow-green, pale or stramineous toward the base. Sheath of the scape shorter than the principal leaves, somewhat loose toward the oblique orifice which terminates in a short, cusplike blade. Scapes 20–70 (–90) cm long, terete and many ridged below becoming somewhat flattened, narrower, and usually one or 2-edged above. Spikes at seeding time ovoid, ellipsoidal or oblong, 5–15 mm long, of many (several in depauperate individuals) rather loosely imbricated bracts. Fertile bracts obovate to oval, 5–7 mm long, the exposed margins subentire, the outer surface pale to dark brown, dull, the dorsal area rectangular to elliptic, green, or brownish on old spikes. Lateral sepals included, about the length of the bracts, linear and slightly curvate, the thin wings broad, the somewhat thicker keel lacerate for the upper ⅔ or ½ its length. Blades of petals cuneate, ca. 3 mm long, yellow, opening in the morning. Seeds broadly ellipsoidal, ca. 4–5 mm long, the longitudinal ribs numerous but faint; cross-lines not evident.

Wet sands or sandy peat or alluvium of roadside ditches, flatwoods pond margins, cypress swamps and lakeshores, but particularly in mechanically disturbed wetlands. Coastal plain, N.J. to Fla., w., chiefly in the coastal plain to Tex., Ark., Tenn. Probably adventive from Latin Am.

19. Xyris difformis Chapm.

Solitary or in small tufts, the soft, pinkish or purplish (rarely greenish) bases rooted on wet sand or muck, perennating by pairs of pale, low-set, lateral shoot buds. Principal leaves broadly linear or linear-elliptic, 10–50 cm long, 0.5–1.5 cm broad, usually flabellately spreading, a dark and lustrous green but toward the bases becoming pinkish, purplish or reddish. Apex of the leaf acute, slightly incurved. Surface of the leaf smooth. Margin of the leaf above the equitant portion usually papillose, rarely smooth. Sheath of the scape shorter than most of the leaves, thin, tight, save at the slightly loosened, oblique orifice whose upper margin converges to a short, cusplike blade. Scapes linear, 15–70 cm long, terete, brownish and twisted below, straightening and becoming deep green and oval in the cross-section above with two prominent, broad, thin ridges whose combined breadth is at least equal that of the scape (in southern specimens) and whose margins are papillose, together with occasional, lower ridges. Spikes at seed bearing time ovoid, ca. 1 cm long (less in northern specimens), acute, dark, of many, usually tightly imbricated bracts of which the lower few are barren (to the north the spikes become shorter, broader, blunter). Fertile bracts 5–7 mm long, obovate to oval, not keeled, the apex rounded and subentire, the outer surface usually deep brown, lustrous, the dorsal area greenish or gray-green, rectangular to round or elliptic. Lateral sepals included, about the length of the bracts, the wings very broad, thin and pale brown, the keel slightly thicker and darker, its margin jagged from about the middle to the apex.

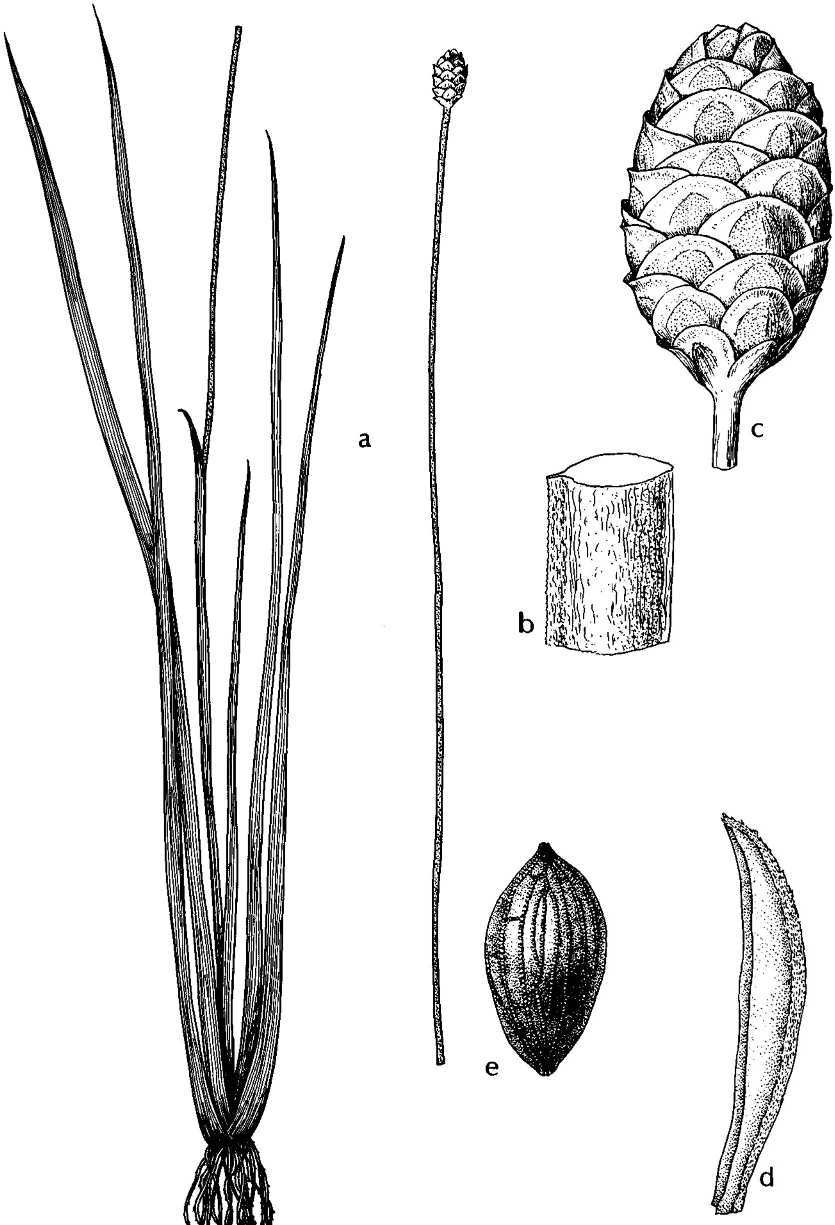

Fig. 292. **Xyris jupicai:** a, habit; b, section of scape; c, head; d, lateral sepal; e, seed.

Blades of the petals cuneate, ca. 4 mm long or less, yellow, unfolding in the morning. Seeds broadly ellipsoidal, ca. 0.5 mm long, translucent, with 24–28 very fine, straight, longitudinal lines of small papillae, the vertical lines straight, but very indistinct.

Wet sands or sandy peats of flatwoods pond margins, ditches and lakeshores, but more often on alluvial situations (often in fairly heavy shade). Primarily in the coastal plain from eastern Texas to its northern limits in New England and southeastern Canada, but inland into the Canadian Shield (by way of the St. Lawrence River?) and Great Lakes system.

20. **Xyris difformis** Chapm. var. **curtissii** (Malme) Kral.

As the species but smaller (not often taller than 2 dm), more tufted, and with the margins of the equitant portion of the leaves very broad and pinkish-translucent. Surfaces of the leaves papillose or low tuberculate, the papillae or tubercles in slightly diagonal lines, the leaf bases pinkish or purplish and similarly papillate. Sheath of the scape looser, the bases a rich brown, sometimes castaneous. Scapes rarely as tall as 20 cm, terete, with many low ridges below, becoming 3–7 carinate and blocky or angled in the cross-section above (save in northern forms which may be oval in cross-section and with but 1 pair on only one of scape ridges), the margins of the scape ridges papillate or scabrid. Spikes at seeding time broadly ovoid to ellipsoidal, seldom longer than 0.5 cm, of but few bracts. Fertile bracts about 3–4 mm long, suborbicular to broadly obovate, the outer surfaces pale to deep brown, lustrous, the dorsal areas ellipsoidal, gray-green, becoming brown and indistinct with age. Lateral sepals included, about the length of the bracts, linear-curvate, a lustrous brown, the thin wings broad, the slightly thicker keel broadened and somewhat lacerate toward its tip, or even entire. Blades of the petals obovate or cuneate, slightly less than 3 mm long, yellowish, unfolding in the early morning. Seeds oblong or ellipsoidal, ca. 0.5 mm long (longer in some northern forms), translucent, with 12–14 faint, longitudinal lines, the vertical lines even more faint. (*X. neglecta* Small.)

Sandy peats of ditches and bogs, flatwoods or acid seepage areas. Great Lakes system and s.e. Can., s., primarily coastal, into pen. Fla., w. to e. Tex.

This little plant, often not taller than such Xyrids as *X. drummondii, X. flabelliformis, X. brevifolia,* is quickly recognizable by its pinkish, papillate bases, caespitose habit, round or scabrous-angled upper scapes, and small, translucent seed. It could be cursorily confused with depauperate examples of the variety *floridana* of *X. difformis,* but these are distinguishable by their farinose seed.

21. **Xyris difformis** Chapm. var. **floridana** Kral. Fig. 289

As the species but with surfaces and margins of the linear (10–30, rarely to 50 cm long, 1.5–6.0 mm broad) leaves tuberculate scabrid, dull green save for the pinkish or purplish or maroon, thin margined, equitant portion, the papillae or tubercles in short horizontal or oblique lines. Sheath of the scape loose save at the very base, which is a deep rich brown, sometimes castaneous. Scapes linear, twisted and terete below, but straight, 20–50 (–75) cm tall, becoming broadly oval or blocky or angled in the cross-section above, with 3–7 (–13) prominent, tuberculate-scabrid ridges, the two broadest comprising the scape edges. Spikes at seeding time broadly ovoid, 1.0–1.5 cm long, acute or sometimes acuminate, of many tightly appressed bracts, the lower barren. Fertile bracts 4–7 mm long, obovate to suborbicular, the outer surface a dark lustrous brown, the dorsal areas dull green, oval or obovate, the exposed margin entire or becoming somewhat lacerate with age. Lateral sepals included, ca 5 mm long, castaneous, the keel lacerate from near the base to the apex. Blades of the petals cuneate, slightly less than 3 mm long, yellow, opening in the morning. Seeds broadly ellipsoidal, slightly less than 0.5 mm long, opaque, with 18–20 somewhat irregular longitudinal, raised ridges together with equally prominent, irregularly disposed vertical cross ridges, these frequently obscured by a farinose substance.

Moist sands and sandy peats of pine flatwoods, savannas and roadsides. Coastal plain south to southern peninsular Florida and west to the Florida parishes of Louisiana.

In most treatments the farinose seed, lacerate sepal keel, and scabrosity of this plant link it with *X. serotina.* Differences between them are shown in the table below.

X. serotina	*X. difformis* var. *floridana*
Plant base greenish or stramineous, often invested in the dull brown leaf bases of the previous season; roots coarse, when fresh a good millimeter broad.	Plant base pinkish, purplish, or maroon, old leaf bases not persisting; roots finer, rarely 1 mm broad.
The plants in large, stiff-leaved, tufts, usually on muck or in shallow water; leaves often ¾ as long as the scapes, seldom narrower than 1 cm at their broadest point above the equitant portion, the surfaces dull yellow-green.	The plants in smaller tufts or solitary, more willowy, usually on moist or wet sands or sandy peats, but not with the bases submersed or on muck; leaves seldom as broad as 1 cm, the surfaces dull but deep green.
Spike dull, broadly ellipsoidal, blunt.	Spike a dark, lustrous brown with sharply contrasting dark green dorsal areas, ovoid, acute.
Seeds ellipsoidal, caudate at one end, over 0.5 mm long, usually closer to 0.6 mm, the longitudinal lines prominent but not much raised, 20–24.	Seeds ovoid to broadly ellipsoidal, about 0.5 mm long, the longitudinal and vertical lines raised, giving the seed a somewhat cancellate look.

Eriocaulaceae (PIPEWORT FAMILY)

(Contributed by Robert Kral)

Rosulate, monoecious or dioecious, biennial or perennial, the roots fibrous, thickened-spongy, or thickened-septate, the stems short, simple or sparingly branched, the leaves linear, often long-tapering. Inflorescence capitate, involucrate, the head terminating a sheathed, fluted scape, the receptacle of the head smooth, hairy, or chaffy; flowers unisexual, actinomorphic or zygomorphic, the perianth members chaffy; sepals 2 or 3, distinct or fused; petals 2 or 3, usually fused at least at the bases, sometimes fused to the apices. Androecium of 2 to 4 (–6) stamens, the anthers introrse, splitting longitudinally, the filaments epipetalous (their bases plus the petal bases comprising an androphore); gynoecium of 2 to 3 carpels, the ovary superior, the locules 2 or 3, raised upon a gynophore and with style branches equalling or doubling the carpel number, the style branches themselves often branched; ovules pendulous, one per locule. Fruit a thin-walled loculicidal capsule.

1. Lacunar tissue (air spaces) in the leaves evident to the naked eye; the larger roots thickened, pale, septate, appearing unbranched; perianth parts in 2s (in ours) the sepals distinct or united into a spathe, the petals united for most of their length into a corolla tube which is 2(–3)-lobed above, each lobe adaxially bearing a jet black gland; trichomes of the perianth clavate, multicellular, at least some of the cells congested with a white, mealy substance; stamens (3–) 4 (–6), the ripe anther surfaces of all the native species black; carpels 2, styles 2-branched, the gynoecium on a conspicuous gynophore (in ours). 1. *Eriocaulon*

1. Lacunar tissue of the leaves not evident to the naked eye; roots either fibrous and evidently branched or, if thickened and fleshy, not septate or evidently branched; perianth parts in 3s the petals if present eglandular; stamens 2 or 3, yellowish or pale; carpels 2 or 3, most commonly 3, the gynophore conspicuous or inconspicuous.

    2. Roots dark, slender, fibrous, evidently branched; scapes smooth or hairy, the hairs neither swollen nor glandular apically; rosette leaves ascending or spreading; inflorescence in the bud turbinate or subglobose, pale gray or whitened; inflorescence when expanded globose or short-cylindrical, the outermost involucral bracts reflexed and obscured by the rest of the inflorescence; corolla lobes absent or vestigial; trichomes of the perianth tips clavate; filaments of the yellowish anthers fused to the rim of an androphore; style branches bifid. 2. *Lachnocaulon*

    2. Roots pale, thickened, spongy, appearing unbranched; scapes hairy, at least some of the hairs swollen at the tips; rosette leaves forming a recurved mat on the substratum; inflorescence in the bud ellipsoidal or narrowly ovoid, flavescent; inflorescence when expanded hemisphaerical, the straw-coloured outer bracts not obscured by the rest of the inflorescence; corolla and calyx both evident, the male corolla tubular, lacerate-dentate at the apex; trichomes of the perianth tapering, acute, not clavate; filaments of the pale anthers separating from the tubular corolla below its rim; style branches simple. 3. *Syngonanthus*

1. Eriocaulon

Rosulate, scapose, often tufted, herbs, the roots evidently cross-partitioned, the leaves linear, arranged in a close spiral toward the apex of a short or elongated, sometimes sparingly branched stem. Perennation by means of lateral offshoots or by rhizomes or stolons (the latter two most often observed when plants are submersed). Inflorescence an involucrate head or contracted spike comprised of an outer involucre and a bracteate mass of scaly, unisexual flowers, the plants being either monoecious or dioecious. Leaves linear, often linear-attenuate, gradually or abruptly flaring toward a clasping base, pale and noticeably aerenchymatous basally, greener and less distinctly lacunate above, the chlorenchymatous proportion of the leaves increasing with extent and duration of emergence. Outer bracts of the inflorescence of few to several imbricate series, broad, green, gray-green or paler, at least the margins translucent. Bracts within the inflorescence usually 1 per flower, chaffy or almost membranaceous, pale to brownish, greenish, or gray, entire or ciliate, the surfaces glabrous or producing multicellular trichomes at least the terminal cells of which are usually congested with a farinose, white material. Sepals 2, scarious, pale or coloured, often translucent, boat-shaped, often covered toward the tips with farinose or clear, multicellular trichomes. Petals 2, fused at least toward the bases, equal or unequal, similar to the sepals but generally narrower and separated from them by a pronounced tubular stalk (which is partly petal and, in staminate flowers, partly stamen) and distinguished from the sepals by a dark gland on the inner, distal surface of each; outer and sometimes inner surfaces frequently with multicellular, clear or congested, trichomes; the margins frequently ciliate; distal end of the male perianth tube concave, sometimes bearing 2–3 dark coloured glands in its centre, these suggestive of the glands of the corolla lobes. (Sepals and petals 3 in California species). Stamens 3 to 4 or 6, 2 or 3 opposite the petals, introrse, but versatile, the anthers dehiscing longitudinally and well-exserted from the inflorescence at anthesis. Carpels 2, locules 2, the ovary stipitate (on a gynophore), the style 2-branched (carpels 3, locules 3 in the California species); ovules 1 per locule, pendulous from the summit of the locules. Fruit a loculicidal capsule, the pericarp thin, often velumlike, the style persisting on the fruit. Seeds ovoid, ellipsoidal or broadly fusiform, variously lined, ridged or papillate.

1. Surface of the receptacle and/or bases of the florets copiously trichomiferous; some or most of the receptacular bractlets and perianth parts with chalk-white trichomes, thus the heads very conspicuously white; diameter of the heads, when in full flower or fruit, at least 0.5 cm, usually more.
  2. Heads, soft, much compressed in drying; sheaths of the scape seeming to exceed all or most of the leaves in length; involucral bracts usually grayish, rounded, the receptacular bractlets grayish and acute; inner surface of the female petals villous; all cells of the clavate trichomes of the perianth whitened, opaque; winter, spring, or early summer flowering and fruiting species of aquatic or wet situations.
    3. Heads seldom less than 1 cm broad at flowering time on scapes seldom shorter than 2 dm which are subtended by leaves seldom shorter than 5 cm, thus the plants robust; roots seldom less than 1 mm broad; lobes of staminate corolla conspicuously unequal. 1. *E. compressum*
    3. Heads usually between 0.5 and 1.0 cm broad at flowering time on scapes seldom as long as 2 dm which are subtended by leaves seldom as long as 5 cm thus the plants low; roots seldom 1 mm broad; lobes of staminate corolla subequal, though inconspicuous. 2. *E. texense*
  2. Heads hard, very slightly compressed in drying; sheathes of the scape usually exceeded in length by most of the leaves; involucral bracts stramineous, acute, the receptacular bracts pale, acuminate; inner surfaces of the female petals smooth; terminal cells of the clavate trichomes of the perianth whitened, but some or all of such hairs with basal cells uncongested, transparent; flowering in late spring or summer. 3. *E. decangulare*
1. Surface of the receptacle of the head lacking trichomes or but sparingly trichomiferous; receptacular bractlets and/or perianth parts smooth or clavate-hairy, thus the heads either dark gray or white; diameter of the heads, when in full flower or in fruit, seldom more than 0.75 cm.
  4. Stamens 6, ovary 3-carpellate, on an elongate gynophore. 4. *E. cinereum*
  4. Stamens 4, ovary 2-carpellate, on a short gynophore.
    5. Heads between 0.5 cm and 1 cm broad at maturity, the outer involucral bracts usually reflexed and hidden by the conspicuously white-hairy bractlets and perianth parts.
      6. All outer involucral bracts and all bracts and sepals save for sepals of male flowers and receptacular bractlets of some populations whitened or stramineous, thus the heads appearing very pale even when young; seed faintly rectangular-reticulate, often with longitudinal lines of papillae. 5. *E. lineare*
      6. All bracts and perianth parts save for outermost involucral bracts and petals darkened, usually gray to almost black, thus the young heads dark; seed very faintly reticulate, not at all papillate. 6. *E. septangulare*
    5. Heads seldom as broad as 0.5 cm, the outer involucral bracts, if reflexed, not hidden by conspicuously white-hairy bractlets and perianth parts.
      7. Bractlets very dark, very lustrous, all subentire and narrowly acute; scapes filiform; plants of the southeastern U.S. or the southwestern U.S.
        8. All perianth parts dark, usually smooth; seed coat conspicuously rectangular-reticulate, the lines made up of close set diagonal bars of a white mealy substance. (Occasionally the inner surface of the linear female petals have a few white, clavate trichomes). 7. *E. ravenelii*

8. All perianth parts, often bractlets, with some white-clavate hairs at least on the margins, thus imparting a dark and white-banded appearance to the mature heads; inner surface of the broadly spatulate female petals hairy. 8. *E. kornickianum*

7. Bractlets stramineus or gray, dull, often evidently erose or lacerate, broadly acute to obtuse; scapes linear. 9. *E. parkeri*

1. Eriocaulon compressum Lam. Fig. 293

Perennial, flaccid-leaved, sometimes tufted, reproducing vegetatively either by short lateral offshoots or by pale, short rhizomes or by leafy stolons (stolons most often produced in summer). Leaves pale green, linear-attenuate, 5.0–30.0 cm long, tapering rather evenly from the broad (1.0–4.0 cm) pale, evidently lacunate, base, smooth. Mature scapes usually solitary, 20.0–70.0 cm long, pale green, 1.0–3.0 mm broad just below the head, glabrous, twisted, with several ridges, the tissue of the grooves very evidently lacunary. Sheath of the scape very loose, usually longer than the mature leaf, slightly flaring above toward the bifid, acute or acuminate apex. Mature head hemisphaerical or globose, 1.0–2.0 cm broad, soft, tending to contain flowers of but one sex, chalk white save for the dark gray or almost blackish exserted tips of the receptacular bracts and anthers. Receptacle of the head with multicellular, narrow, translucent trichomes. Outer involucral bracts grayish-translucent (sometimes the very outermost flavescent), 2–3 mm long, broadly ovate or oblong or elliptic, the tips rounded or obtusely angled, frequently squarrose; bracts within the inflorescence (receptacular bractlets) a dark gray, 2–3 mm long, spatulate-linear or oblong, acute with clavate white trichomes on the dorsal apical surface. Male flower: sepals separate, translucent, linear or linear-spatulate, smooth and pale basally, the apex acute to acuminate, with a scattering of white, clavate trichomes on the back; corolla tube clavate, with 2 unequal oblong lobes, the larger of which has an apical fringe of white clavate trichomes and the smaller of which is either smooth or with a very few clavate trichomes on the tip; stamens 3 or 4, the anthers black, ca. 0.5 mm long, on filaments of unequal lengths but usually slightly exserted at anthesis; central glands (staminodia?) 3 or 4, sessile or short-stalked, short-oblong, black, slightly shorter than the anthers. Female flowers: sepals oblong-spatulate, acute, translucent but dark, the outer and inner surfaces smooth or hairy, the inner hairs long, multicellular, transparent, the outer ones (particularly toward the sepal tip) clavate, white; corolla tube short, the two petal lobes subequal, oblong-spatulate, acute, pale translucent, the inner surface with long, filiform, multicellular clear trichomes, the outer surface with white, clavate, trichomes, particularly toward the apex. Seeds broadly ovoid to almost as broad as long, ca. 0.5 mm long, slightly compressed, a dark and lustrous brown, the surface sometimes echinate.

Sands or sandy peats of shallow pineland ponds, lakeshores, seepage bogs, savannas, ditches or low flatwoods. Coastal plain, N.J. to e. Fla., w. to e. Tex.

In stature and habit *E. compressum* somewhat resembles *E. decangulare,* a tall summer and fall flowering *Eriocaulon,* but differs from it in having a more spongy foliage, softer heads, a less-hairy receptacle, and darker coloured bracts the tips of which are acute or rounded rather than acuminate. In fact, it is closest in appearance to a shorter plant, *E. lineare,* which also has soft, white, usually hemisphaerical heads, but differs from that species in having larger, often unisexual (rather than bisexual) heads, the receptacular surfaces of which have at least sparse hairs (those of *E. lineare* are smooth). Also, the surface of the seed of *E. compressum* is smoothish while that of the seed of *E. lineare* is indistinctly cancellate, sometimes papillate.

This is perhaps the showiest of all the Eriocaulaceae of the southeastern United States, in springtime so abundantly decorating the shallow waters of pinelands as to appear like a shower of white confetti.

2. Eriocaulon texense Korn. Fig. 294

A clump former, perennating by means of short lateral offshoots. Leaf pale green, linear-attenuate, 1.0–5.0 cm long, tapering evenly from a fleshy, pale, often trichomiferous, aerenchymatous base, the inner surfaces often noticeably papillose. Sheath of the scape usually about the length of the leaf or somewhat longer (on drier sites very

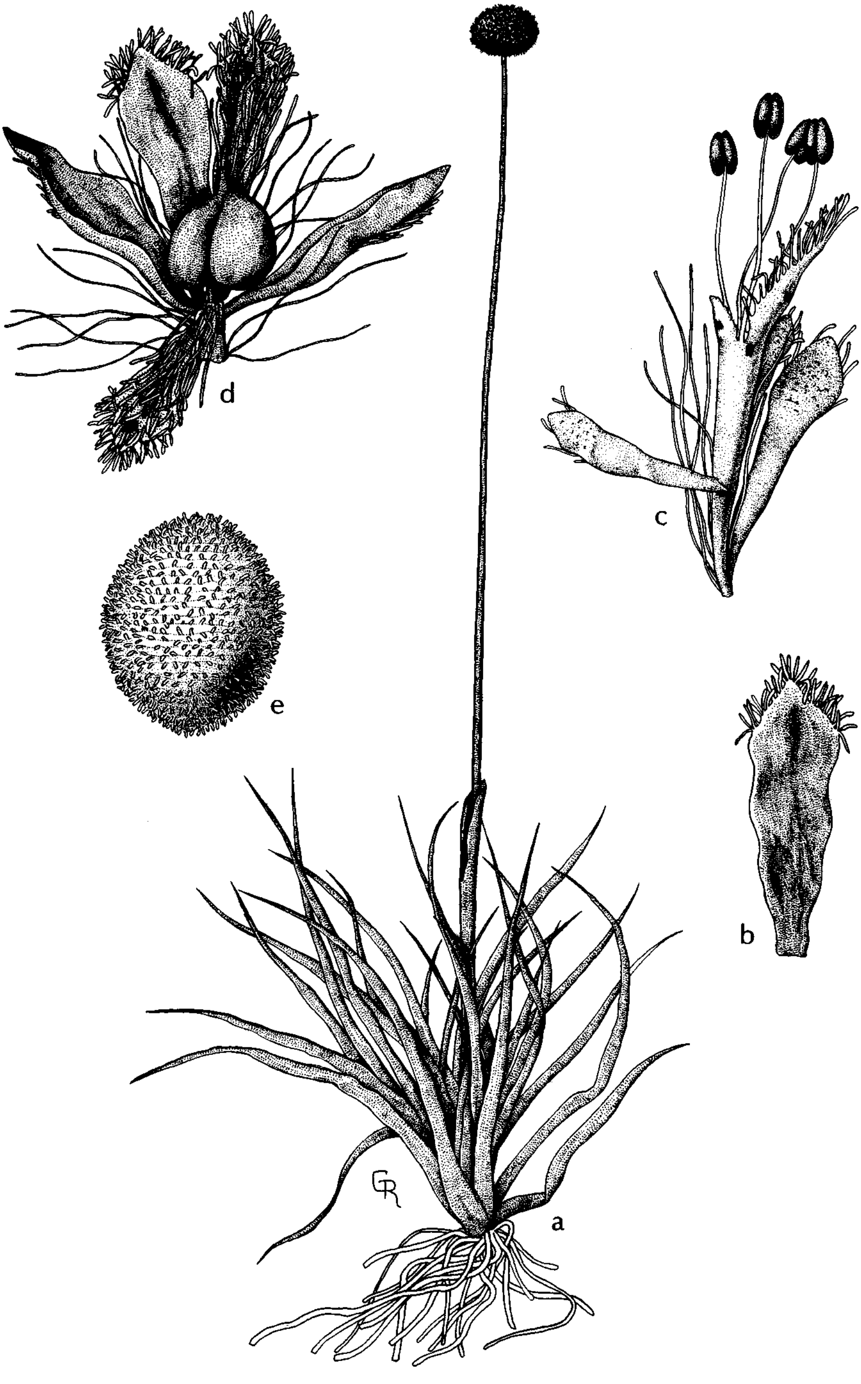

Fig. 293. **Eriocaulon compressum:** a, habit; b, receptacular bract; c, staminate flower; d, pistillate flower; e, seed.

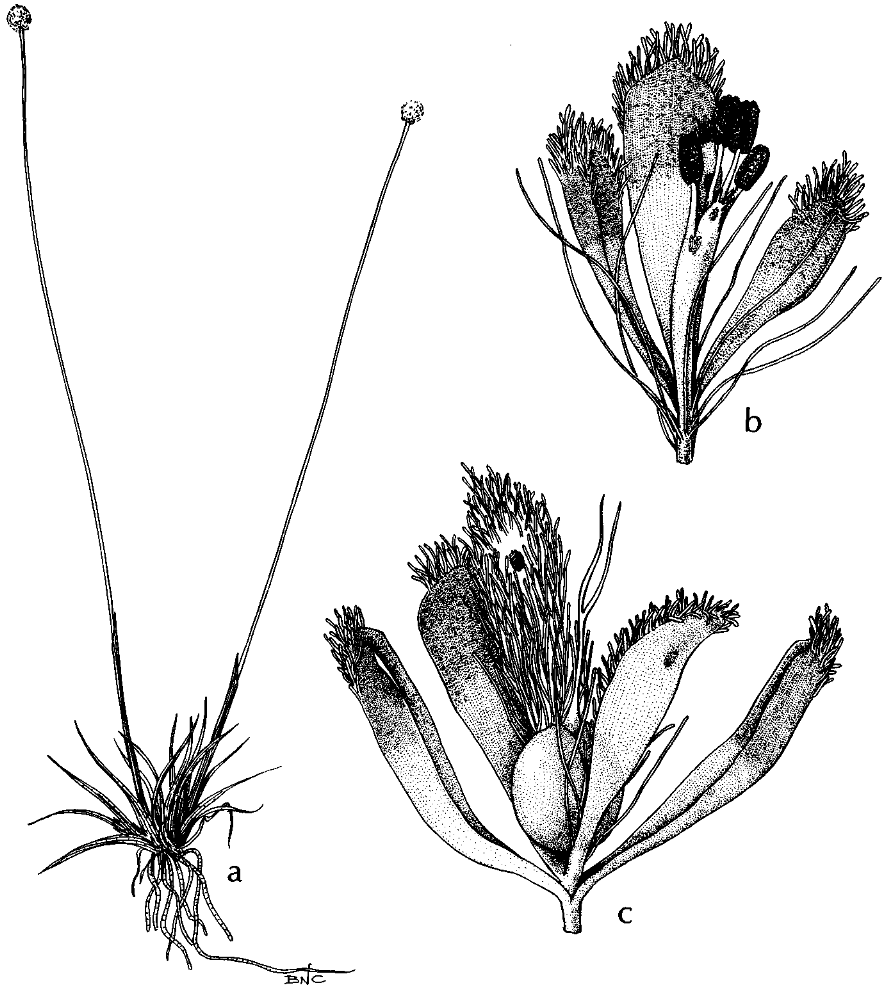

Fig. 294. **Eriocaulon texense:** a, habit; b, staminate flower; c, pistillate flower.

conspicuously longer), 3–5 cm long, the orifice expanded oblique, bifid. Mature scape 5–30 cm long, slightly twisted, 4–7 ridged. Mature head hemisphaerical, ca. 5 mm broad, rarely subglobose, gray save for the white exserted trichomes of the bractlets and perianth parts and for the outer bracts of the involucre which are stramineous. Surface of the receptacle densely beset with long tapering, clear, sometimes exserted, multicellular trichomes. Outer involucral bracts suborbicular to broadly obovate, apiculate to rounded, ca. 1.5 mm long, stramineous, smooth, scarious, reflexed at maturity and usually hidden by the florets, grading gradually into the dark gray, translucent, narrowly obovate to cuneate, acute, receptacular bractlets whose margins are ciliate with white-clavate trichomes. Male flower: sepals 2, linear-spatulate, keeled, scarious, pale and translucent basally, dark gray and opaque apically, ca. 1.5 mm long, acute, white-clavate-hairy on the backs and margins apically. Petals 2, largely fused into a clavate-cylindrical yellowish structure (the androphore), the base of which has long, tapering, transparent multicellular trichomes and apex of which is divided into 2 unequal, narrowly triangular lobes whose apices are primarily made up of clavate, white hairs. Anthers black, broadly ellipsoidal, ca. 0.5 mm long, exserted at anthesis from the heads on yellowish filaments about 1.0 mm long. Female flower: sepals narrowly oblong-obovate, ca. 1.5 mm long, sharply curvate-keeled, dark gray, the backs white-clavate hairy apically along the keel, the margin eciliate; petals equal or unequal, linear to oblong or obovate, ca. 1.0–1.5 mm long, yellowish-white, acute, the inner surfaces pilose with a mixture of clear tapering and opaque-clavate, multicellular trichomes, the outer surface sparingly clavate-hairy, the margin clavate-hairy. Seeds ovoid, ca. 0.6 mm long, obscurely and shallowly alveolate, brownish with frequent, pale, narrow tubercles along the low ridges.

Acid, sphagnous (*Sarracenia*-type) bogs. Westernmost Fla. Panhandle, s.w. Ala. to e. Tex.

This rather rare *Eriocaulon* is part of the complex including *E. lineare, E. septangulare* (see discussion under those species). I have not seen it in other than sphagnous *Sarracenia*-type bogs, and hence have no idea what habital changes it expresses when submersed. It is locally abundant in central Louisiana, coating bog potholes with its small but showy white heads. Unlike the two other species of the complex, this *Eriocaulon* is a spring bloomer; by early summer no trace of it is to be seen, even the leaves appearing to vanish. Small specimens of *E. decangulare* from Texas are often identified as *E. texense*. However, the heads of *E. texense* are soft in contrast to the harder heads of *E. decangulare;* the involucral bracts of *E. texense* are rounded to acute, sometimes squarrose, and quite dark in contrast to the more rigid, stramineous, narrowly acute to acuminate bracts of *E. decangulare;* the scapes of *E. texense* are more slender and with less ridges than those of *E. decangulare; E. texense* has usually flowered, set fruit, and is dying back by the time the heads of *E. decangulare* are full.

3. **Eriocaulon decangulare** L. Fig. 295

A clump former, but reproducing vegetatively either by short lateral offshoots or by very stout, branching rhizomes. Leaf linear-attenuate to linear-acute (the wetter the site, the greater the taper), 10.0–40.0 cm long, smooth, a rich green, tapering evenly from the broad (1.0–4.0 cm) pale green or yellowish, spongy, translucent base into a narrow but blunt, sometimes callused, tip. Sheath of the scape loose, shorter than the leaves, flaring slightly toward the bifid orifice (which, when young, is oblique and acute). Mature scape 30.0–110.0 cm long, 1.0–3.0 mm broad just below the head, twisted, with several (8–12) pale green ridges, the grooves a paler green and narrower than the ridges. Mature head subglobose, 1 to 2 cm broad, hard (little compressed in pressing), a dull white, the lowermost flowers and bractlets reflexed, thus obscuring the subtending involucral bracts. Surface of the receptacle villous, the trichomes long and multicellular, usually clear. Outer involucral bracts narrowly ovate to lanceolate, 2.0–4.0 mm long, stramineous, acute, with clavate white hairs on the backs apically. Bracts of the receptacle linear to oblong-lanceolate, 3.0–4.0 mm long, pale, narrowly acute to acuminate, sometimes

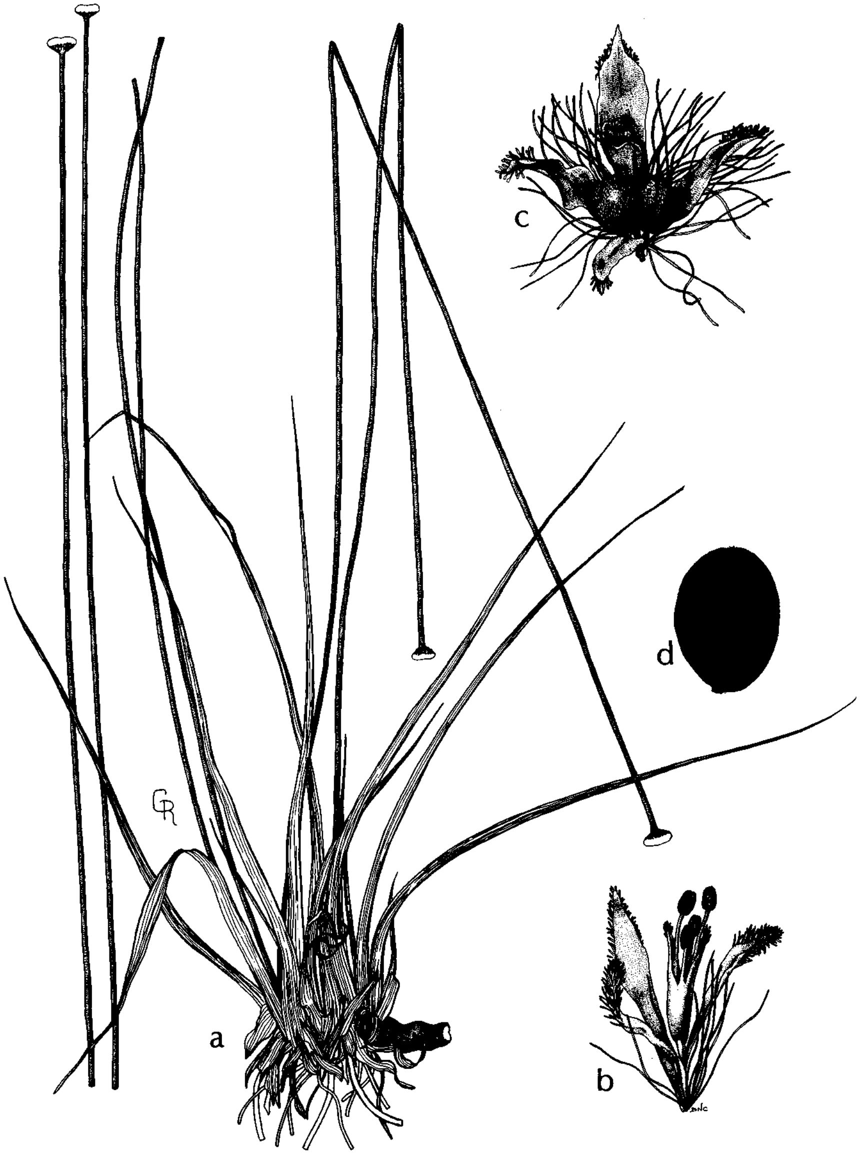

Fig. 295. **Eriocaulon decangulare:** a, habit; b, staminate flower; c, pistillate flower; d, seed.

exserted enough to give the head a slightly echinate appearance, with clavate white hairs on the backs or glabrous at the exserted tips. Male flower: sepals linear, about 3.0 mm long, yellowish-white, translucent, slightly curvate, narrowly keeled, the keel and apex with white-clavate trichomes the basal cells of which are clear; petals fused into an elongate tube ⅔ the length of the sepals but produced ultimately into 2 triangular or linear lobes about 1 mm long, translucent, whitish-yellow; each bearing a small tuft of white and clavate hairs on the back apically; anthers broadly ellipsoidal, exserted on filaments about 3 mm long. Female flower: sepals linear, 2.0–3.0 mm long, keeled, yellowish-white, slightly curvate, acute, clavate-hairy on the backs toward the apices; petals spatulate or with narrowly elliptic blades on claws about half the length of the blades, pale, glabrescent or with long clear hairs on the backs basally, short-clavate hairs on the backs terminally; seeds ellipsoidal, 0.75–1.0 mm long, very finely cancellate or sometimes the cancellae concealed by rows of delicate subappressed hairs.

Sandy or peaty lakeshores, pine flatwoods, ditches, margins of cypress domes, or savannas; sometimes, in ponds or lakes, in water to a depth of at least 1 m and almost covering the substratum, only occasional plants flowering and only the uppermost portions of the scapes and the heads emersed. Primarily coastal plain, N.J. to Fla., w. to e. Tex.

This is the most robust of the Eriocaulons of the southern United States and it is certainly one of the more conspicuous floral elements in the midsummer and fall savannas, its white "buttons" providing a pleasing contrast in a sea of grass and sedge. It is also to be distinguished from sympatric Eriocaulons by its narrowly acute to acuminate receptacular bractlets, the pale tips of which are noticeably exserted from the heads, and by the firmer character of its foliage and inflorescences. The stature, leaf length and breadth, and the head size of *E. decangulare* all tend to be less as one travels west toward Texas or north along the Atlantic coastal plain. The largest examples of this species are to be found in northwest Florida (*E. decangulare* var. *latifolium* Chapm. ex Moldenke).

4. Eriocaulon cinereum R. Br. Fig. 296

Solitary or in small tufts, the leaves narrow, linear-attenuate, to 9 cm long, green, thin, tapering very gradually to a filiform tip. Sheath of the scape 2–4 cm long, definitely shorter than the leaves, scarious and bifid-acute above. Mature head subglobose to very broadly ovoid, about 4 mm broad, silvery-gray, somewhat chaffy in appearance. Outer involucral bracts ranging from obovate to lanceolate, about 2 mm long, scarious, pale, the tips acute, often lacerate or erose. Receptacular bractlets linear-oblong, about 2 mm long, scarious, pale save for a grayish mid-region, the tips acute. Surface of the receptacle of the head with a few long, very slender, transparent, multicellular trichomes. Male flower: sepals united into a single spatulate, lustrous, scarious, 3-lobed scale which is gray-translucent toward the apex, pale toward the clawed, tubular base, glabrous save for a few white, short-linear trichomes at or toward the tip. Petals 3, joined into a yellowish tubular-clavate androphore about 2 mm long whose base is enveloped by the calyx tube and whose apex is divided into 3 small, scalelike, white-hairy (the hairs tapering) glanduliferous lobes. Central glands 3, white or yellowish-white. Stamens 6. Anthers broadly ellipsoidal, about 0.25 mm long, yellow, on white filaments about as long as the corolla lobes. Female flowers: perianth consisting of 2 or 3 (if 3, one much narrower and shorter) linear, flat, pale, translucent scales about 1.5 mm long whose margins are connivent, acute tips may bear a few multicellular clear trichomes. Gynophore at least 1 mm long, usually somewhat longer, smooth. Gynoecium 3-carpellate; style branches 3. Seeds ovoid, slightly less than 0.5 mm long, pale brown, reticulate, the rectangular compartments of the reticule oriented perpendicularly to the axis of the seeds.

Adventive in rice paddies, Acadia Parish, La. and Stanislaus Co., Calif. Native in n. Australia and in the rice-growing regions of the South Pacific.

5. Eriocaulon lineare Small. Fig. 297

A clump former, but reproducing vegetatively either by short lateral offshoots (on moist

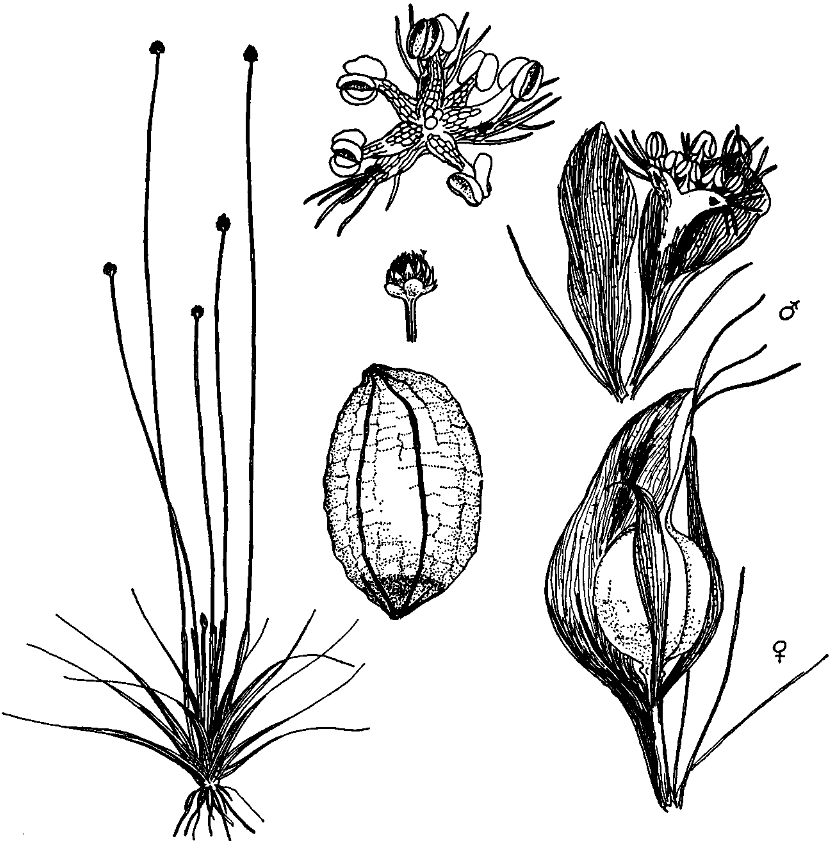

Fig. 296. **Eriocaulon cinereum.** (From Kral in *Sida* 2: 310. 1966)

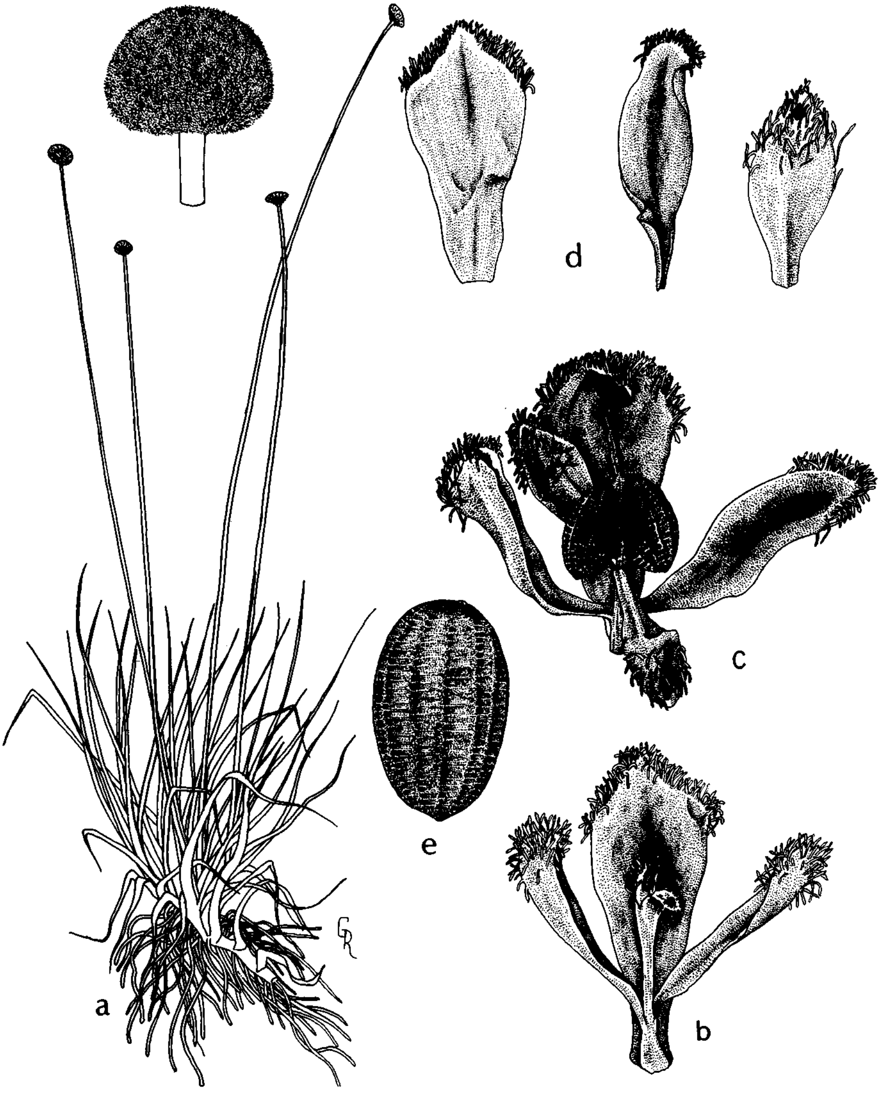

Fig. 297. **Eriocaulon lineare:** a, habit and head; b, staminate flower; c, pistillate flower with seeds; d, left to right: bract, sepal, petal of pistillate flower; e, seed.

situations) or by pale, elongated, leafy rhizomes (on submersed or wet situations). Leaf bluish green, linear attenuate, 1.0–10.0 cm long, tapering evenly from a fleshy, pale, aerenchymatous base 1.5–4.0 mm broad. Sheath of the scape slightly longer than or about as long as the leaf, the oblique orifice acute or bifid-acute. Mature scape 6.0–15.0 (–40.0) cm long, about 1 mm thick below the head, (longest and thickest when the plants are submersed), slightly twisted, with 4 to 7 slightly elevated, dark green ridges, the shallow grooves yellowish or at least a paler green. Mature heads hemisphaerical or globose, rarely short-cylindrical, 4.0–6.0 mm broad, whitish. Surface of the receptacle of the head smooth. Outer involucral bracts orbicular or ovate, 2.0–2.5 mm long, pale, the tips rounded, entire, sometimes squarrose, the margin often scarious. Receptacular bractlets obovate or cuneate, ca. 2 mm long, the bases scarious save for a slightly darkened midrib, the apices hairy on the backs with white, clavate hairs. Male flower: sepals translucent, grayish, concave-curvate, oblong-linear, 1.5–2.0 mm long, acute, the outer surfaces with white-clavate hairs apically; petals largely fused into a narrowly cylindrical structure 1.0–1.5 mm long, solid at the basal, slightly narrower end, gradually broadened above at which point the two short (ca. 0.5 mm) ciliate corolla lobes depart, and on the concave inner surface of which are two sessile black glands; anthers black, broadly ellipsoidal, ca. 0.5 mm long, exserted from the heads on white filaments 1.0–1.5 mm long. Female flower: sepals oblanceolate, ca. 2 mm long, keeled, curvate, greenish or grayish brown, the apices rounded and with a covering or fringe of white-clavate hairs on the backs; petals spatulate, 1.5–2.0 mm long, flat, yellowish white, the apices rounded and white-hairy on both sides, the inner surfaces often with a mixture of clear and opaque hairs. Seeds ovoid or ellipsoid, 0.5–0.75 mm long, indistinctly longitudinally lined with fine connecting striae.

Sandy or peaty lakeshores, margins of pineland ponds, ditches, and savannas. Coastal plain, N.C. to Fla. and Ala.

This species is locally abundant, being commonest in the limesink country of northern Florida, where in midsummer its white "buttons" ring the sandy sinkhole lakes and ponds. Length and breadth of leaf and scape vary drastically within the species, this directly related to degree or extent of submersion. Thus, a perfect continuum of habit may be found if one would run a cross contour line through a population. Those furthest from the shore would be the shortest leaved and have the shortest, narrowest scapes, while submersed forms have extremely elongated, spongy, leaves and scapes. Difficulties in identification of *E. lineare* stem from partial samples from such populations, the larger specimens having some resemblance to *E. septangulare.*

Cursorily, *E. lineare* most closely resembles *E. septangulare,* whose range it may contact to the north and northwest, and *E. texense,* whose range it does contact to the west. A detailed examination of the Eriocaulons comprising this complex may well result in a far more conservative treatment of them than now exists. *E. lineare* is the only one of the three to have a perfectly smooth receptacular surface and flavescent outer bracts. On the other hand, *E. septangulare* has some populations in which the surface of the receptacle has trichomes, others in which it does not.

6. Eriocaulon septangulare With. Fig. 298

A clump former but reproducing vegetatively either by short lateral offshoots (on moist situations) or by pale, elongated, leafy rhizomes (on submersed or wet situations). Leaf pale green, linear-attenuate, 1.0–8.0 cm long, tapering evenly from a fleshy, pale, aerenchymatous base. Sheath of the scape usually shorter than the leaf if the plant is emergent, 2.0–6.0 cm long, the orifice oblique, bifid. Mature scape 4–21 (–100 submersed) cm long, about 1 mm broad, slightly twisted, (4–) 5–7-ridged. Mature heads hemisphaerical or globose, 4.0–5.0 mm broad, gray save for the exserted white-hairy tips of perianth parts and bractlets. Surface of the receptacle of the head smooth or very rarely with a few tapering multicellular, clear trichomes. Outer involucral bracts broadly oblong, narrowly ovate or broadly obovate, 1.0–1.5 mm long, smooth, dark gray, tips rounded to obtusely angled and often scarious. Receptacular bractlets about 1.5 mm

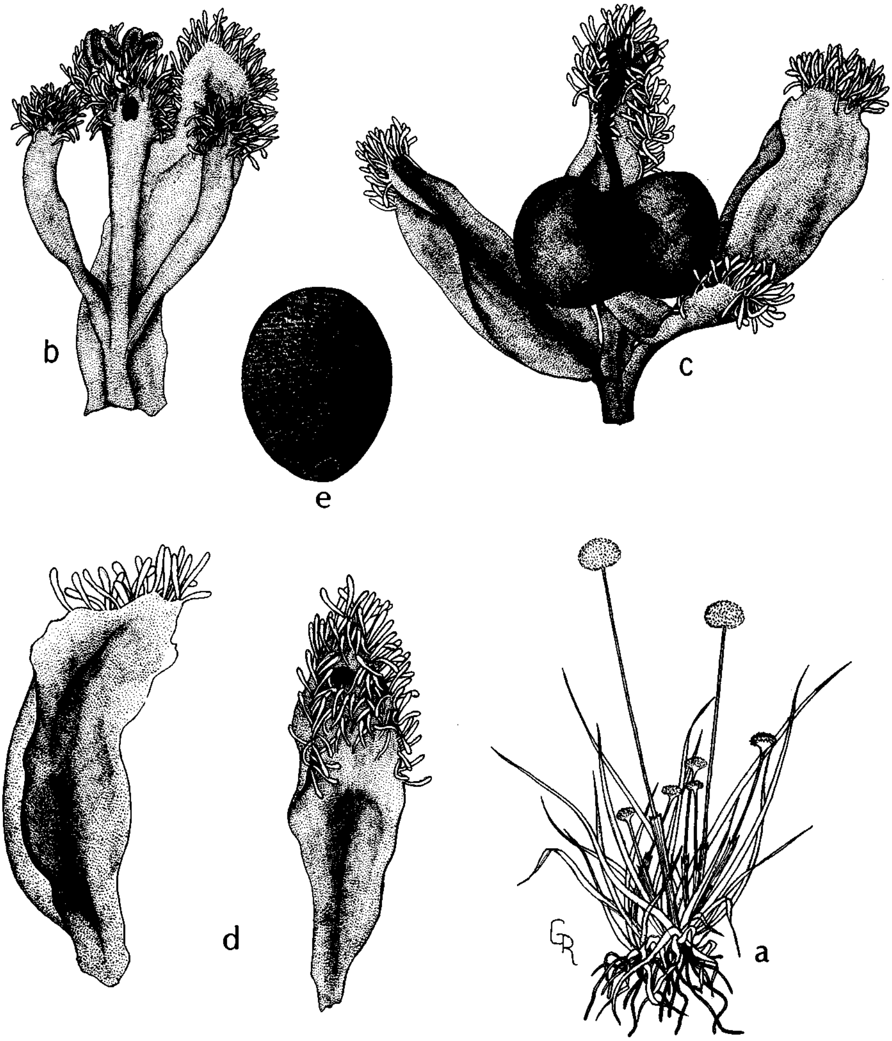

Fig. 298. **Eriocaulon septangulare:** a, habit; b, staminate flower; c, pistillate flower; d, left to right: sepal, petal; e, seed.

long, oblanceolate or cuneate, slightly and unequilaterally keeled, whitish or yellowish basally, becoming dark gray apically, the apical portion white-clavate-hairy on the backs. Male flower: sepals gray-translucent, oblong-linear or linear-oblanceolate, ca. 1.5 mm long, concave-curvate with an obscure keel, acute to rounded, the outer apex and upper margin white clavate hairy. Petals subequal, pale, largely fused into a narrowly cylindrical structure about 1.2 mm long, acute, the inner surfaces around the glands and upper margin of the petal lobes with white-clavate hairs. Anthers black, broadly ellipsoidal, ca. 0.5 mm long, very slightly exserted or not at all exserted from the head on short white filaments. Female flower: sepals oblong to narrowly obovate, prominently curvate-keeled, ca. 1.5 mm long, gray-translucent or almost opaque save for the pale base, white-clavate hairy on the backs distally and often ciliate. Petals linear-oblong or linear oblanceolate, ca. 1.5 mm long, acute to obtuse, the upper inner surfaces and upper margins white-clavate hairy. Seeds ovoid, ca. 0.5 mm long, obscurely longitudinally lined with fine connecting striae or very obscurely and shallowly alveolate.

Sandy or peaty lakeshores, margins of ponds, ditches, muskeg, and sphagnous bogs, the Canadian Shield of southern Canada, the Great Lakes region, New England, and south in the Appalachians into mountainous N.C.

In habit, habitat, and floral character this species most closely resembles *E. lineare* and *E. texense,* entities with which it may someday be considered as identical. However, it does differ from *E. lineare* by its darker, grayish or sooty bracts, bractlets, and sepals and from *E. texense* by its much smoother receptacle.

7. **Eriocaulon ravenelii** Chapm. Fig. 299

Perennial (biennial?), glabrous, the stem short and unbranched, the plants low, with scapes seldom exceeding 2 dm. Leaf bluish-green, linear-attenuate (save on drier situations where leaves become shorter, more acute-tipped), aerenchymatous tissue evident almost to the tip, 3.0–7.0 (–15.0) cm long. 3.0–5.0 mm broad at the base, longer than the sheath of the scape. Sheath of the scape loose, gradually widening above to a deeply slit apex. Scape 10–20 cm long, slightly twisted, 4–5(–6)-ribbed. Head gray-brown, rarely charcoal gray, subglobose, 3–4 mm broad. Receptacle of the head smooth or with sparse, clear trichomes. Outer bract oblong-ovate or broadly cuneate, 2 mm long, pale gray, translucent, rounded to acute. Inner bract and receptacular bractlet cuneate, ca. 2 mm long, a darker gray, translucent, shining, acute to acuminate or lacerate. Male flower: sepals separate, oblong to oblanceolate, gray, usually acute; corolla tubular, very slightly expanded above, the two corolla lobes very small, pale, scalelike, with inconspicuous glands; anthers 4, round, black, about the same length as the filaments. Female flower: sepals narrowly oblong, narrowly cuneate, or linear, the apex acute to mucronate; petals narrowly cuneate or oblanceolate or oblong, acute, smooth or with a few trichomes on the inner surface or terminally, the glands inconspicuous; ovary on a short gynophore. Seeds dark brown, somewhat lustrous, broadly ellipsoidal, ca. 0.5 mm long, irregularly alveolate, the individual alveolae mainly rectangular.

Mildly acid sandy pineland swamps, particularly on wet disturbed areas toward the Atlantic coast. Coastal plain, e. S.C. to Fla., w. to Miss.

8. **Eriocaulon kornickianum** Van Heurck & Muell.-Arg. in Van Heurck. Fig. 300

Solitary or in small tufts, reproducing vegetatively by short lateral offshoots. Leaf pale green, very thin, linear-attenuate, 1–5 cm long, tapering evenly from a thin, pale, aerenchymatous base, the margin slightly incrassate. Sheath of the scape about the length of most of the leaves (ca. 2–3 cm) loose, somewhat inflated and scarious above, bifid. Mature scape filiform, 5–8 cm long, about 0.5 mm broad, twisted, 3–4-ridged. Mature head subglobose or short-oblong, 3.0–4.0 mm broad, dark gray or gray-green save for pale "rims" of the white-ciliate perianth parts and bracts and the pale, scarious, outer bracts. Outer involucral bracts broadly oblong to suborbicular, reflexed at maturity, 1.0–1.25 mm long, smooth, very thin, stramineous, translucent, the apex rounded. Receptacular bractlet oblong to cuneate, ca. 1.5 mm long, gray or gray-green, acute to

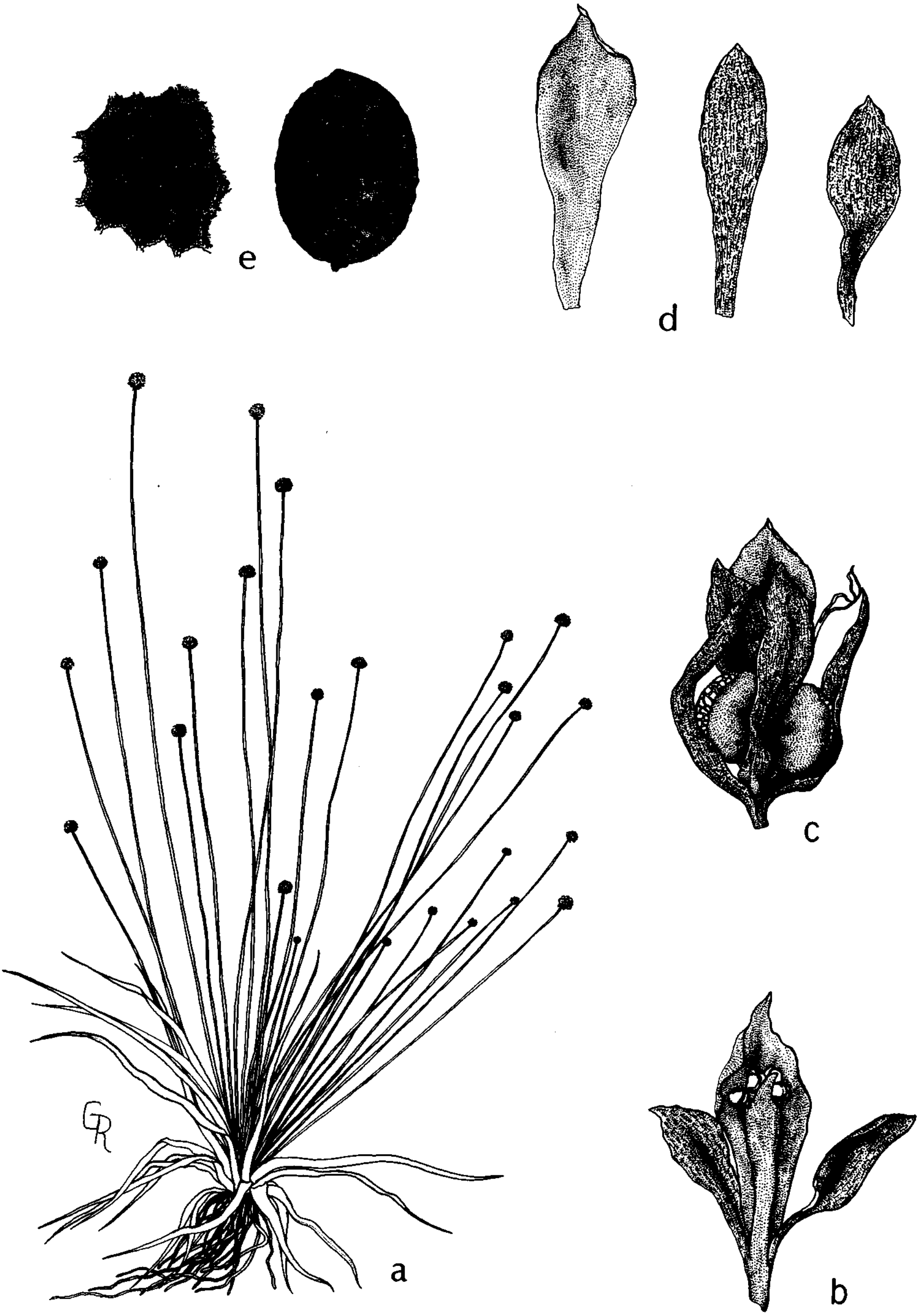

Fig. 299. **Eriocaulon ravenelii:** a, habit; b, staminate flower; c, pistillate flower; d, left to right: bract, sepal, petal; e, seed and enlargement of a bit of its surface area.

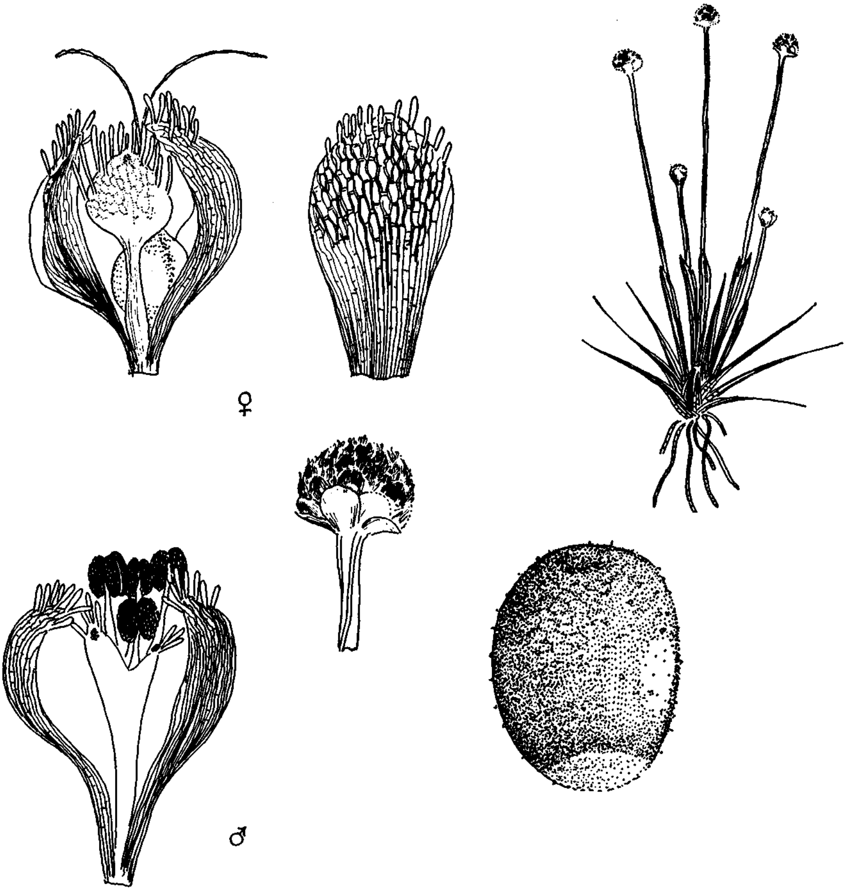

Fig. 300. **Eriocaulon kornickianum.** (From Kral in *Sida* 2: 298. 1966)

obtusely angled, translucent, concave and unequilaterally keeled, smooth save for a scattering of white, clavate, trichomes along the somewhat erose upper margin. Surface of the receptacle of the head smooth. Male flower: sepals linear-curvate, concave, ca. 1 mm long, grayish-translucent, with a few white, clavate, trichomes on the backs apically. Corolla members subequal, yellowish, primarily consisting of a narrowly obpyramidal androphore which terminates in two low, glanduliferous, toothlike lobes whose apices have a few white-clavate trichomes. Female flower: sepals linear-curvate, ca. 1 mm long, gray-translucent save for the pale, clawed bases, smooth or with a scattering of hairs on the backs apically; petals spatulate, curvate, the blades broadly rhombic and opaque, the bases clawed, ca. 1 mm long or slightly longer, yellowish white, the inner surface and upper margin with white-clavate trichomes. Seeds broadly ovoid, ca. 0.5 mm long, deep reddish brown, the surfaces papillate or rugose.

Upland seepage areas and bogs. Interior highlands (Magazine Mt., Ark.) s. and w. to Okla. and Tex.

Superficially this is closest to *E. ravenelii* of the eastern coastal plain, differing from it primarily in its smaller stature, its trichomiferous bractlets and perianth parts, and its smaller, rugose rather than alveolate, seeds.

9. **Eriocaulon parkeri** B. L. Robinson. Fig. 301

Low plants, solitary or in small tufts from short lateral offshoots. Leaf linear attenuate, 2–6 cm long, tapering to a filiform-terete tip, pale green. Sheath of the scape somewhat shorter than to the same length as the leaves, inflated, bifid-acute. Mature scape filiform, to 30 cm long, ca. 1 mm broad, very slightly twisted, 4–5-ridged. Mature heads hemisphaerical, dull gray or stramineous, 3–4 mm broad. Outer involucral bract ovate to suborbicular or obovate, ca. 2 mm long, scarious, stramineous to lead coloured, glabrous. Inner involucral bract cuneate to narrowly obovate, ca. 2 mm long, acute, gray-scarious, translucent, smooth or with white-clavate trichomes on the back of the apex. Surface of the receptacle of the head smooth. Male flower: sepals linear-curvate, keeled, ca. 2 mm long, gray, translucent, smooth or with a few white trichomes on the back apically; petals fused into a narrowly obcylindrical, yellowish white tube, the corolla lobes reduced to 2 very small triangular, white-hairy appendages. Female flower: sepals oblong or oblanceolate, ca. 2 mm long, curvate keeled, gray, translucent; petals about the length of the sepals, spatulate, yellowish white, smooth or with a very few white-clavate hairs apically and on the inner surface. Seeds ovoid, ca. 0.5 mm long, rarely to 0.7 mm long, the base truncate, reddish brown, with a very delicate reticulum of horizontally oriented rectangles.

Muddy tidewater riverbanks. S.e. Can. to e. N.C.

This species has been most often confused with *E. septangulare* but may be distinguished from it by the following criteria: (1) Scape tending to be straight rather than twisted, and with fewer ridges. (2) Head narrower (seldom more than 0.4 mm), hemisphaerical, the outer involucral bracts a very pale, dull gray or stramineous, in contrast to the broader, when mature subglobose, heads of *E. septangulare* the outer involucral bracts of which are much darker and more lustrous. (3) Bracts and perianth parts sparingly clavate-hairy, often some perianth parts smooth, in contrast to the more pubescent perianth and bractlets of *E. septangulare.* (4) Involucral bracts tending to remain ascending even on the fruiting heads, thus mainly concealing the bractlets and florets while, on *E. septangulare*, the involucral bracts tend to be reflexed in the flowering and fruiting heads and are themselves partly concealed by the hairy florets.

2. Lachnocaulon

Perennial, rosulate, scapose, often tufted herbs, the roots branched, slender, fibrous, the leaves linear, arranged in a close spiral toward the apex of a short, or elongated, sparingly-branched, stem on which the old leaf bases persist as scales. Perennation by means of lateral offshoots or by short-ascending rhizomes. Leaves linear, acute or attenuate, spirally arranged, the bases clasping, crowded, none of the leaf evidently

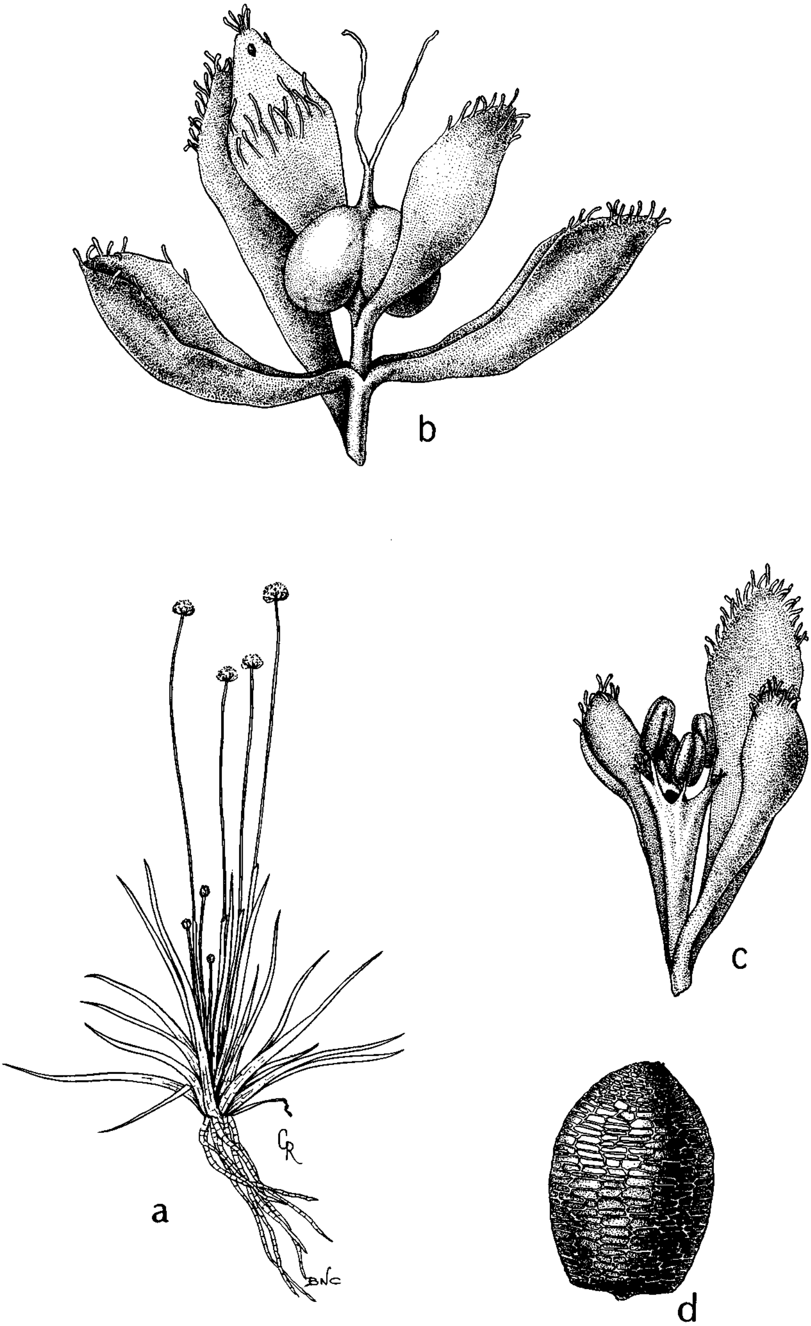

Fig. 301. **Eriocaulon parkeri:** a, habit; b, pistillate flower; c, staminate flower; d, seed.

lacunate. Inflorescence and involucrate head or contracted spike comprised of an outer involucre of few to many series and of a bracteate mass of scaly, unisexual flowers. Receptacle of the inflorescence covered by pale or yellowish, multicellular, filiform trichomes. Each flower subtended by, and partly enfolded by, a scarious bract (or two), the tip of which is sparingly equipped with translucent or opaque, usually clavate, multicellular trichomes. Sepals 3, distinct, scarious, smooth or sparingly clavate-hairy, particularly toward the apex. Petals absent or reduced to hairs or small scales. Stamens 2–3, elevated upon a tubular, stipelike androphore which is at least the length of the stamens; filaments linear, anthers oblong-linear, 2-locular, yellowish or pale, exserted from the heads at flowering time; staminodia 3, lance-ovoid or peglike, often with fimbriate appendages. Gynoecium on a short, usually comose, gynophore, 3-carpellate, 3-locular, 3-ovulate (2-merous in *L. digynum*), the ovules attached distally in the locules; styles (2–) 3, joined for more than half their length; ovary wall thin, velumlike. Fruit a (2–)3-chambered, loculicidal capsule. Seeds ellipsoidal, striate or reticulate or papillose.

In the United States, *Lachnocaulon* may be distinguished readily from either *Eriocaulon* or *Syngonanthus* by its fine, evidently branched root system in contrast to the relatively unbranched-septate systems of *Eriocaulon* and the unbranched and fleshy systems of *Syngonanthus.*

Lachnocaulons of the United States may be divided into two groups on the basis of habitat. One, comprised of *L. engleri* and *L. minus,* is usually found on such ephemeral habitats as fluctuating lake and pondshores, roadbank seepage, borrow pits, ditches, spoilage, and geologically recent sandy sloughs, particularly along the seacoast. Thus such species tend to be aspect dominant one summer in a given locale, seemingly absent the next. It would appear in such case that their seeds must have to remain viable over extended periods of time, for some of the ephemeral Florida lakes about which they often abound are periodically bone dry. The other group, comprised of *L. anceps, L. beyrichianum,* and *L. digynum,* appears in more stable situations inland within the coastal plain province as well as along the coast and on disturbed situations. They usually are on what appears to be much more acid substrata such as those provided by hillside bogs in the longleaf pine hills, peaty savannas, pine-palmetto flatwoods, and sphagnous bogs. Both *L. beyrichianum* and *L. anceps* have a wide range of tolerance to soil moisture in that they may be found on quite dry sandy sites, sometimes even in association with turkey oak (*Quercus laevis*).

1. Trichomes of the apices of the receptacular bractlets and perianth parts congested with a milk white substance, this imparting a pale gray or whitish colour to the heads; plants very often long-lived, forming large convex mats of hairy-leaved rosettes, each rosette terminating an elongate-ascending, scaly stem; scapes hairy.
  2. Leaves narrowly linear; mature heads seldom broader than 4 mm; seeds dark reddish brown, very lustrous, the longitudinal ribs obscure. 1. *L. beyrichianum*
  2. Leaves linear; mature heads seldom as narrow as 4 mm and usually paler than the above; seeds not as lustrous, the longitudinal lines evident. 2. *L. anceps*
1. Trichomes of the apices of the receptacular bractlets and perianth parts not congested with a milk-white substance, thus translucent so that the brown bractlets and/or perianth parts impart their own colour to the heads; the plants either relatively short-lived and short-stemmed or, if long-stemmed, with diminutive, *Polytrichum*-like leaves.
  3. Scapes with ascending hairs; heads a dull gray-brown, the hairs of the receptacle and of the flowers so copious as to at last partly obscure the florets (old heads may lose some of their hairs). 3. *L. minus*
  3. Scapes smooth; heads either chocolate brown or dull brown, but, if dull brown, with female sepals yellowish white and hardly obscured by the receptacular hairs and with the gynoecium 2-carpellary.
    4. Heads dark chocolate brown or reddish brown, usually oblong by seeding time; gynoecium 3-carpellate; leaves seldom shorter than 2 cm, the sheaths of the scapes shorter than to about the length of the leaves. 4. *L. engleri*
    4. Heads pale brown, usually globose by seeding time; gynoecium 2 carpellate; leaves seldom as long as 2 cm, the sheaths of the scapes longer than the leaves or at least rising above them. 5. *L. digynum*

1. Lachnocaulon beyrichianum Sporleder ex Korn. Fig. 302

A clump former, the tufts of leaves aggregated into dense mats of rosettes, the length of the subterranean, ascending stems chaffy with persistent old leaf bases (those plants on driest sites having the longest stems).. Leaf narrowly linear-attenuate, 1.5–4.0 cm long, grayish green, gradually broadening, then abruptly flaring to a sheathing base 2.5–4.0 mm broad; upper and lower surfaces pilose, the margins hairy or smooth. Sheath of the scape attenuate-tipped, pilose, slightly longer or slightly shorter than the leaves. Scape 15.0–23.0 cm long, twisted, obscurely ridged, pilose, with long, ascending, translucent, multicellular trichomes. Mature heads globose or short-oblong, pale gray, 3.5–4.0 (–5.0) mm broad. Outer involucral bracts ovate, about 1 mm long, castaneous, glabrous or sparingly clavate-ciliate on the backs toward the apex. Receptacular bracts pandurate, 1.5–2.0 mm long, obtuse, brownish, smooth toward the base, hairy on the back distally, the hairs clavate, milk-white. Male flower: sepals linear-spatulate, 1.5–2.0 mm long, obtuse, castaneous or paler brown, smooth basally, white-hairy on the back and margin distally, the hairs clavate; androphore smooth, clavate, as long as or slightly longer than the sepals; anthers yellowish, short-oblong, on filaments slightly exserted from the head. Female flower: sepals linear or linear-spatulate, about as long as but broader than the male sepals, obtuse, tan or pale brown, the backs and margins pilose, the hairs toward the apex white and clavate; gynophore short, subtended by a dense coma; gynoecium 3-carpellate, 3-locular, 3-ovulate, the styles 3, bifid. Seeds ellipsoidal, somewhat flattened, reddish brown, about 0.5 mm long, the longitudinal and connecting striae faint, the seed coat therefore highly lustrous.

Sands, sandy peats and peat of pine flatwoods, moist pineland savannas, pineland pond margins, lakeshores and rather dry oak-pine barrens. Coastal plain, s.e. N.C. to cen. pen. Fla.

The affinities of this species to *L. anceps* are at once evidenced by its habit, habitat, leaf and scape indument and especially by its white-clavate perianth trichomes. Yet the leaves of *L. beyrichianum* are consistently narrower, and its seeds comparatively smooth and lustrous. Such differences, though seemingly minor, appear to hold even in mixed populations of the two.

2. Lachnocaulon anceps (Walt.) Morong. Fig. 303

A clump former, the tufts of leaves aggregated into mats of rosettes, the length of the subterranean stems which support the rosettes variable with age of the plant and conditions of soil texture and moisture, but stems closely beset by fibrous, overlapping old leaf bases, these often bearing hairs. Fresh leaves narrowly to broadly linear, attenuate or acute, 2.5–5.5 mm long, broadening evenly to a sheathing base 2.0–3.5 mm broad, pale green or gray-green; leaf surfaces smooth, ciliate or with a scattering of multicellular, translucent trichomes. Sheath of the scape acuminate, slightly shorter or slightly longer than the leaves, smooth to pilose. Scape 15.0–40.0 cm long, twisted, obscurely ridged, smooth or sparingly to densely ascending-pilose. Mature head globose to short-cylindric, 4.0–7.0 mm broad, whitish or pale gray. The longer of the outer involucral bracts brownish, oblong or obovate, 1.0–1.5 mm long, obtuse, the upper margin characteristically fringed with white clavate hairs. Receptacular bracts narrowly pandurate, spatulate or oblanceolate, 1.5–2.0 mm long, obtuse or acute, slightly curvate, brownish or grayish, smooth toward the base, white clavate-hairy on the backs distally or at least ciliate. Male flower: sepals linear-spatulate, slightly curvate-concave, 1.5–2.0 mm long, acute and with white, clavate hairs on the backs toward the apex; receptacle comose, with translucent trichomes; androphore smooth, narrowly obpyramidal; anthers yellowish or pale, oblong, very slightly exserted on short filaments. Female flower: sepals oblong to linear, 2.0–3.0 mm long, acute, scarious, yellowish or pale brown, smooth or pilose on the backs distally, the trichomes clavate, white; receptacle and base of gynophore copiously pilose with pale, linear, translucent hairs, the gynophore short; gynoecium 3-carpellate, 3-locular, 3-ovulate, the styles 3, bifid. Seeds ellipsoidal, 0.5 mm or slightly longer, pale to dark brown, longitudinally lined with pale or sharp ridges,

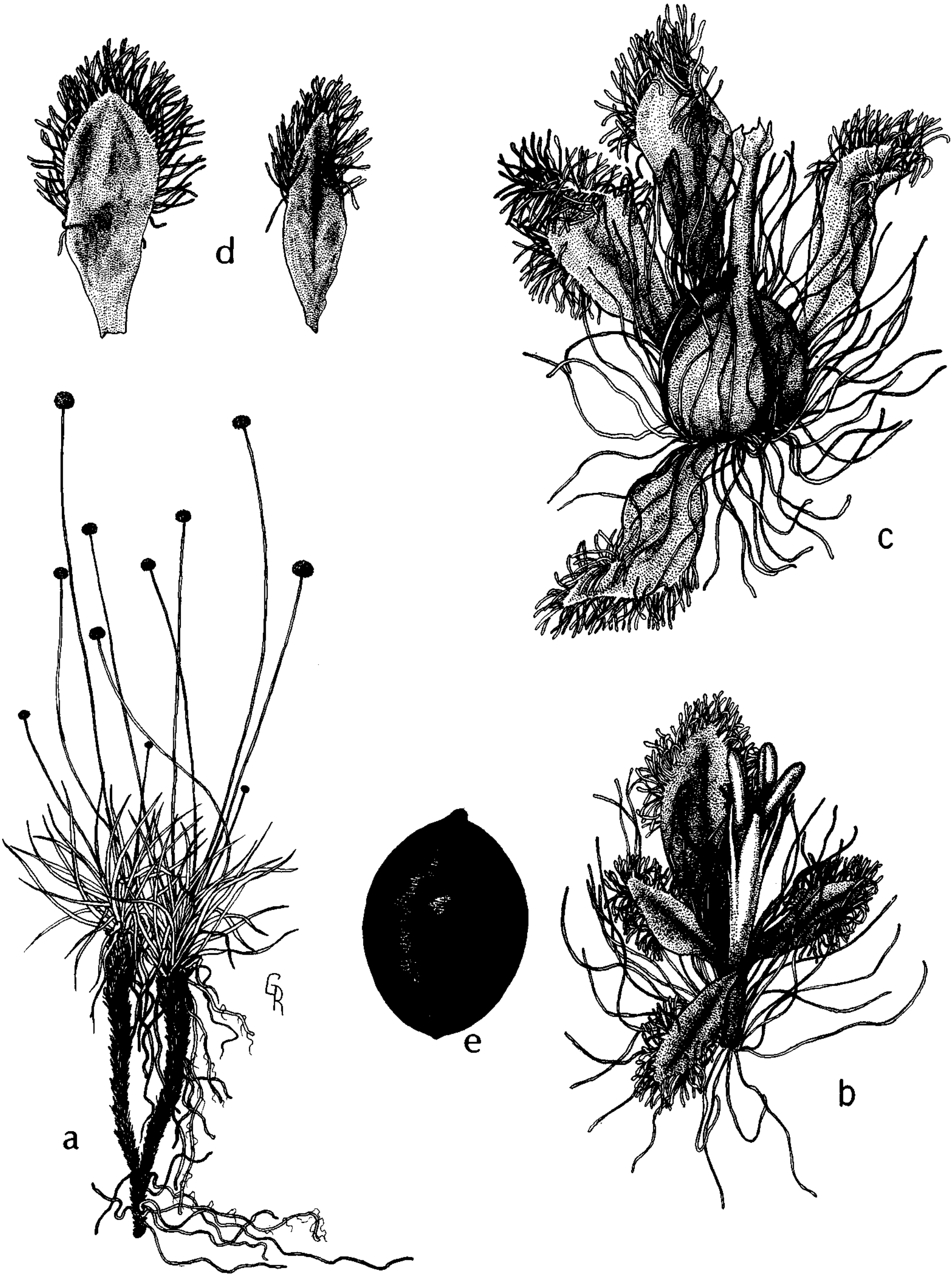

Fig. 302. **Lachnocaulon beyrichianum:** a, habit; b, staminate flower; c, pistillate flower; d, left to right: receptacular bract, sepal; e, seed.

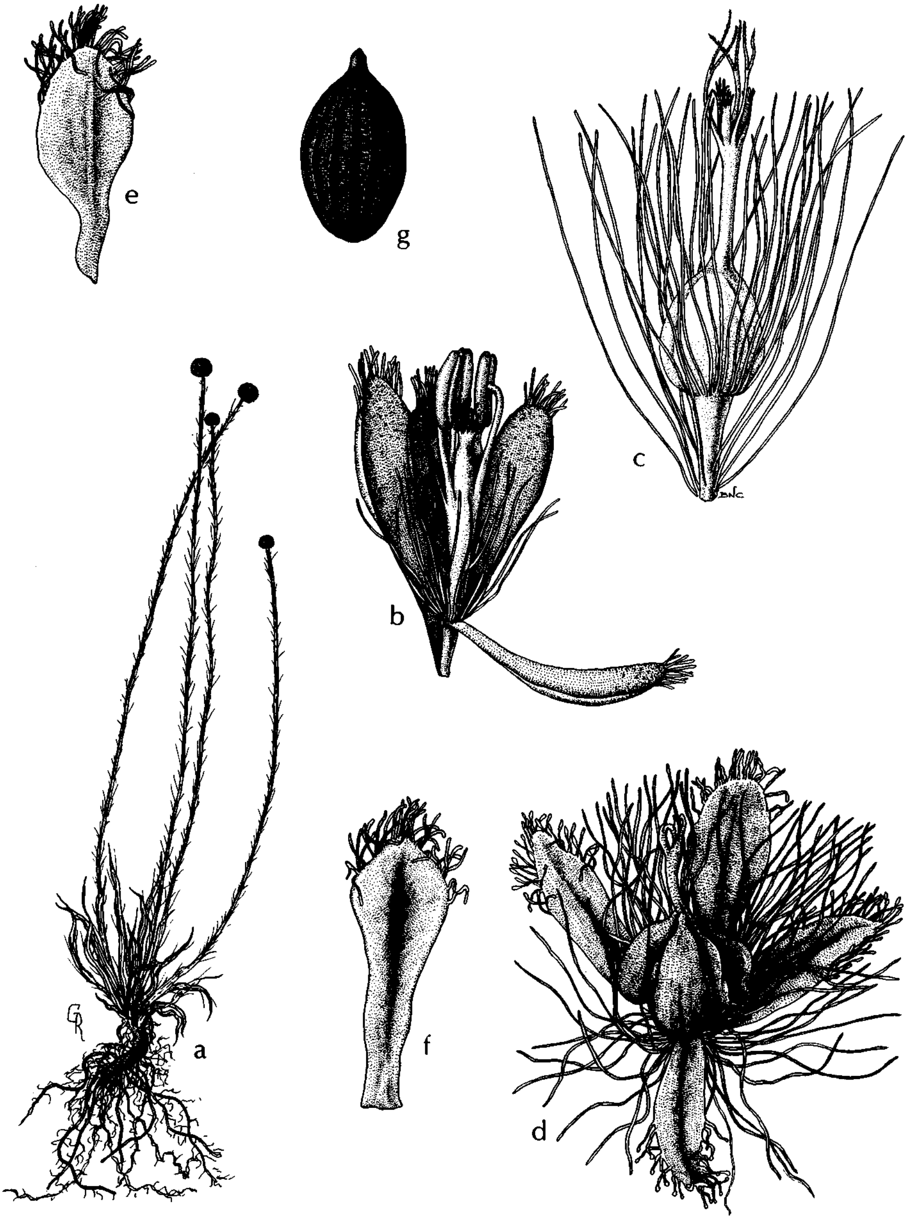

Fig. 303. **Lachnocaulon anceps:** a, habit; b, staminate flower; c, pistillate flower with sepals dissected away; d, pistillate flower; e, receptacular bract; f, sepal; g, seed.

these connected by less conspicuous cross-lines. (*Lachnocaulon glabrum* Korn; *Lachnocaulon floridanum* Small)

Moist to fairly dry sands, sandy peats or peat of pine flatwoods, savannas, upper edges of pinelands, pond margins, ditchbanks, lakeshores, and bogs. Coastal plain, N.J. to Fla., w. to e. Tex.

There are difficulties in distinguishing smaller-headed versions of *L. anceps* from *L. minus* or from *L. beyrichianum.* These, however, will have the clavate-whitened hair on the bracts and sepals to distinguish them from the former and a definitely ridged-and-striate seed to distinguish them from the latter. Also, none of the other Lachnocaulons have, in their older, "seeding" heads, the property of well-exserted bracts and female sepals. This imparts a "chaffy" look to late summer inflorescences.

3. **Lachnocaulon minus** (Chapm.) Small. Fig. 304

A clump former or solitary, the tufts of leaves developing from short lateral offshoots. Leaf yellowish green, linear-acute or linear-attenuate, 2.0–3.0 cm long, evenly narrowing from a base 2.0–4.0 mm broad, smooth or with a scattering of multicellular, filiform, trichomes. Sheath of the scape acuminate, slightly longer or shorter than the leaf, pilose, at least toward the orifice. Mature scape 6.0–15.0 cm long, twisted, obscurely 3-ridged, with ascending, dense or scattered, multicellular trichomes or smooth. Mature head globose to cylindrical, 4.0–6.0 mm long, 3.0–4.0 mm broad, grayish or pale gray-brown. The longer of the outer involucral bracts ovate, 1.0 mm long or slightly longer, obtusely angled, pale brown, somewhat scarious, ciliate with clavate, translucent hairs. Receptacular bracts broadly spatulate or pandurate, 1.0 mm long or slightly longer, slightly rounded or obtusely angled, curvate, sometimes slightly keeled, pale brown to castaneous, the surfaces smooth and scarious basally, hairy on the backs apically or ciliate, at least some of the hairs clavate and all of the hairs translucent. Surface of the receptacle densely comose, with linear, long, multicellular and translucent hairs. Male flower: sepals broadly spatulate, curvate, about 1.0 mm long or slightly longer, the apex rounded or obtusely angled, castaneous, sparingly to copiously clavate-hairy on the backs, the base greenish or pale, smooth; receptacle hairy; androphore obpyramidal, smooth, about the length of the sepals; anthers barely exserted on filaments shorter than themselves or of about the same length, oblong, pale or yellowish. Female flower: sepals broadly linear or narrowly spatulate, approximately the length of the male sepals, scarious and pale or greenish tan below, dark to pale brown and sparingly clavate-hairy or ciliate (rarely smooth) on the back above. Receptacle and gynophore densely pilose with stramineous hairs, the gynophore very short. Gynoecium 3-carpellate, 3-locular, 3-ovulate, the styles 3, bifid. Seeds ellipsoidal, about 0.5 mm long, a deep clear brown, longitudinally striate with pale lines, the connecting striae evident. (*Lachnocaulon eciliatum* Small)

Sands, sandy-peats and peatmuck of margins of pineland ponds, ditchbanks, lakeshores, or moist exposed sands of mildly acid seepage areas and mildly acid marshes along the seacoast. Coastal plain, N.C. to Fla., s.e. Ala.

This species may occur in mixed populations with *L. anceps* or *L. engleri.* It is distinguished from the former by its smaller stature, smaller, darker heads, and by the translucent rather than white-opaque, clavate trichomes on bracts and sepals. It is distinguished from the latter by its usually hairy scapes. *L. minus* appears to require more moisture than *L. anceps.*

4. **Lachnocaulon engleri** Ruhl. in Engler. Fig. 305

A clump former or solitary, the tufts of leaves developing from short lateral offshoots. Leaf linear-acute to linear-attenuate, yellowish green, 2.0–3.0 cm long, evenly narrowing from a clasping base 2.5–4.0 mm broad, the upper and lower surface smooth or with a very distant scattering of clear, multicellular, filiform trichomes. Sheath of the scape acuminate, smooth, sometimes split, the same length as or slightly shorter than, the leaf. Mature scape 6.0–15.0 cm long, twisted, evidently 3-carinate, smooth. Mature head

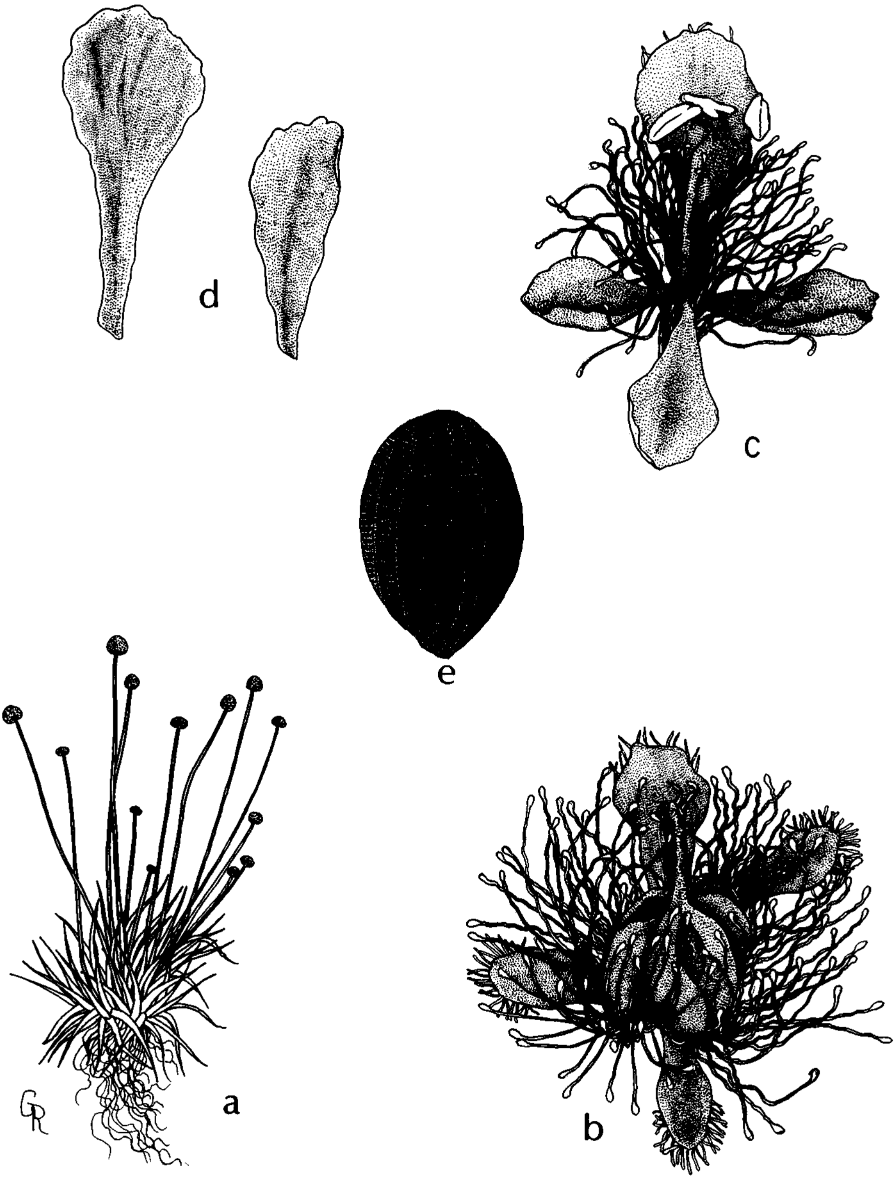

Fig. 304. **Lachnocaulon minus:** a, habit; b, pistillate flower; c, staminate flower; d, left to right: receptacular bract, sepal; e, seed.

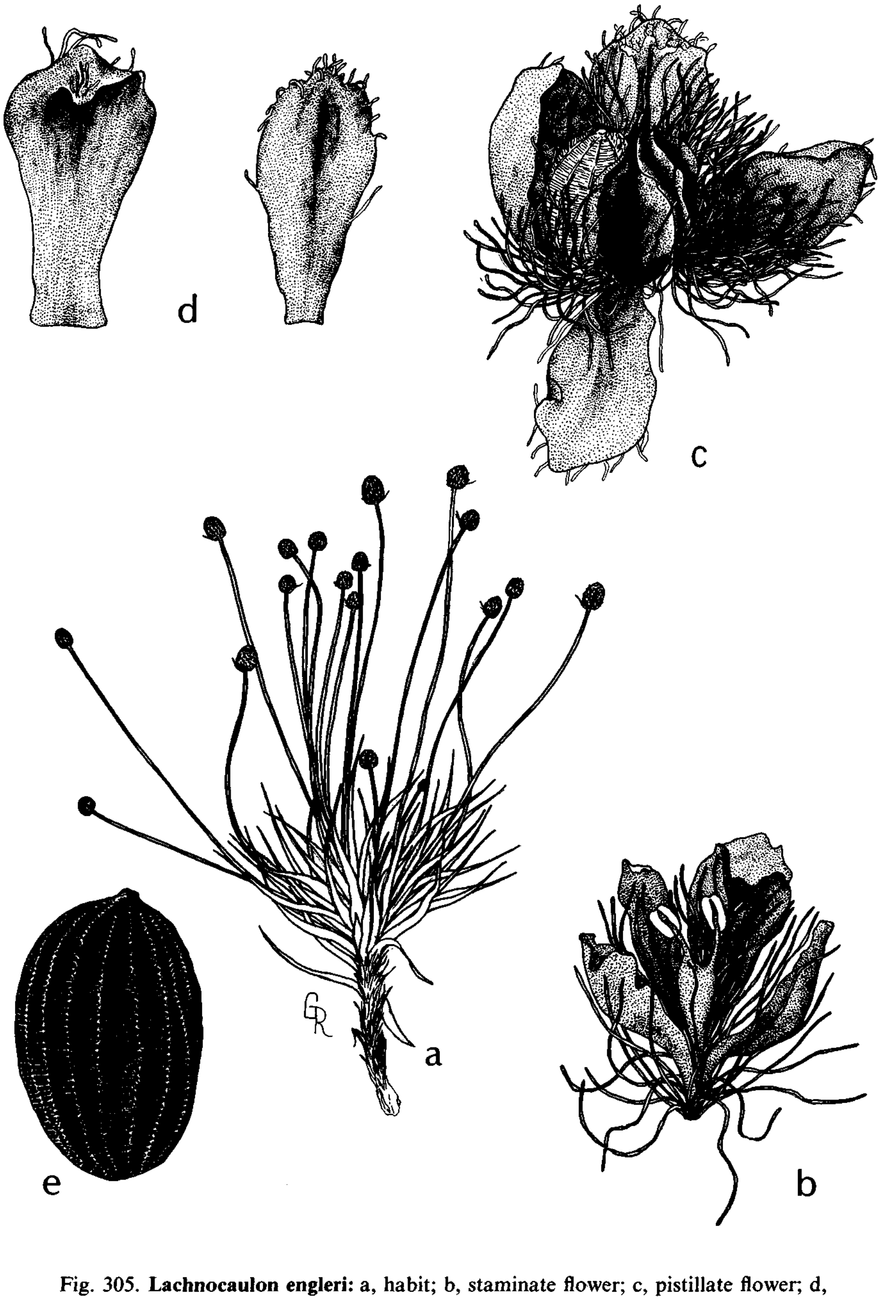

Fig. 305. **Lachnocaulon engleri:** a, habit; b, staminate flower; c, pistillate flower; d, left to right: receptacular bract, sepal; e, seed.

globose to short-cylindric, 3.0–8.0 mm long, 3.0–4.0 mm broad, dark brown, appearing smooth in contrast to the heads of other *Lachnocaulon.* The longer of the outer involucral bracts broadly ovate, 1.0–1.5 mm long, obtuse or broadly acute, ciliate, castaneous or light brown. Receptacular bractlets oblong or obovate, 1.0–1.5 mm long, concave-curvate, pale below and translucent, castaneous distally, the obtuse tips smooth or with a few stramineous, clavate, clear hairs. Surface of the receptacle of the head pilose, the hairs filiform, translucent, yellowish. Male flower: sepals linear or oblong-curvate, about 1.0 mm long, concave, glabrous and pale toward the narrowed bases, the lateral sepals evidently keeled, rounded or obtusely angled, dark brown and with a few stramineous, clavate hairs on the backs distally; receptacle comose, with filiform trichomes; androphore smooth, obpyramidal, slightly shorter than the sepals, rarely tipped with small, clavate hairs; anthers 2 or 3, short-oblong, very slightly exserted from the head at anthesis, yellowish. Female flower: sepals oblong, about the same length as the male sepals, concave-curvate and smooth or with a few multicellular, clavate trichomes on the backs distally, brownish; receptacle and gynophore copiously pilose with pale brownish, filiform hairs; gynoecium 3-carpellate, 3-locular, 3-ovulate, the styles 3, bifid. Seed ellipsoidal, about 0.5 mm long, a rich transparent brown, the longitudinal lines conspicuous, the cross-lines evident to form narrowly oblong cancellae.

Moist sands, sandy-peats or peat-muck of pineland pond margins, lakeshores, and mildly acid marshes along the seacoast. Outer coastal plain, Fla., s. Ala.

The dark brown inflorescence, glabrous scape, and deep brown, lustrous seed of this species distinguish it from all others of the genus that have been found in Florida.

The almost "spontaneous" development of large populations of this species on recently disturbed wet sands or upon the drying peat left by fluctuating lake and pond margins in Florida makes one wonder whether any habitat of relative permanence is occupied by this species. Certainly its seed must have an inherent capacity to remain dormant for such extended periods of time as necessary for such ephemeral habitats to recur. A similar behavior is noted for *L. minus,* a species with which *L. engleri* most frequently is found.

5. **Lachnocaulon digynum** Korn. Fig. 306

A clump former, dense tufts of rosettes forming from slender ascending rhizomes which develop from axillary buds. Leaf linear-acute, 0.6–1.0 (2.0) cm long, bright yellowish green, evenly narrowing from a clasping base 1.0–2.5 mm broad, almost smooth or with a scattering of multicellular trichomes, these usually most abundant toward the margins. Sheath of the scape acute, or bifid, longer than the leaves, smooth or sparingly ciliate toward the orifice. Scape 5.0–10.0 cm long, slightly twisted, 3-ridged, smooth or with a distant scattering of filiform, multicellular trichomes. Head grayish or dull gray-brown, globose, or hemisphaeric, 2.0–3.5 mm broad. The longer of the involucral bracts triangular, ca. 1.0 mm long, brownish, with translucent clavate trichomes on the backs distally. Receptacular bracts spatulate, 1.0–1.3 mm long, acute or obtusely angled, a rich brown, clavate-hairy on the backs apically. Receptacular surface densely hairy, but the hairs not so long as to obscure the female sepals. Male flower: sepals linear-spatulate, ca. 1.0 mm long, curvate, a rich brown, sparingly clavate-hairy on the backs apically; receptacle hairy; androphore smooth, obpyramidal, about the length of the sepals, the apices oblique, anthers 3, yellowish, oblong, slightly exserted on filaments about as long as themselves. Female flower: sepals broadly spatulate to narrowly obovate, ca. 1.0 mm long, keeled, and curvate, hence connivent over the ovulary, whitish-yellow, smooth or with a few marginal hairs distally; receptacle and short gynophore copiously pilose with pale, translucent, multicellular, slightly clavate, trichomes; gynoecium 2-carpellate, 2-locular, 2-ovulate, the styles 2, bifid. Seeds ovoid to ellipsoidal, about 0.5 mm long, longitudinally striate, the connecting striae finer, almost obscure.

Wet acid exposed sands and sandy peats or seepage bogs, pineland pond margins, ditches and roadbanks. Coastal plain, Fla. Panhandle to s. Miss.

This species, which is particularly abundant in the wet pine flatwoods country about

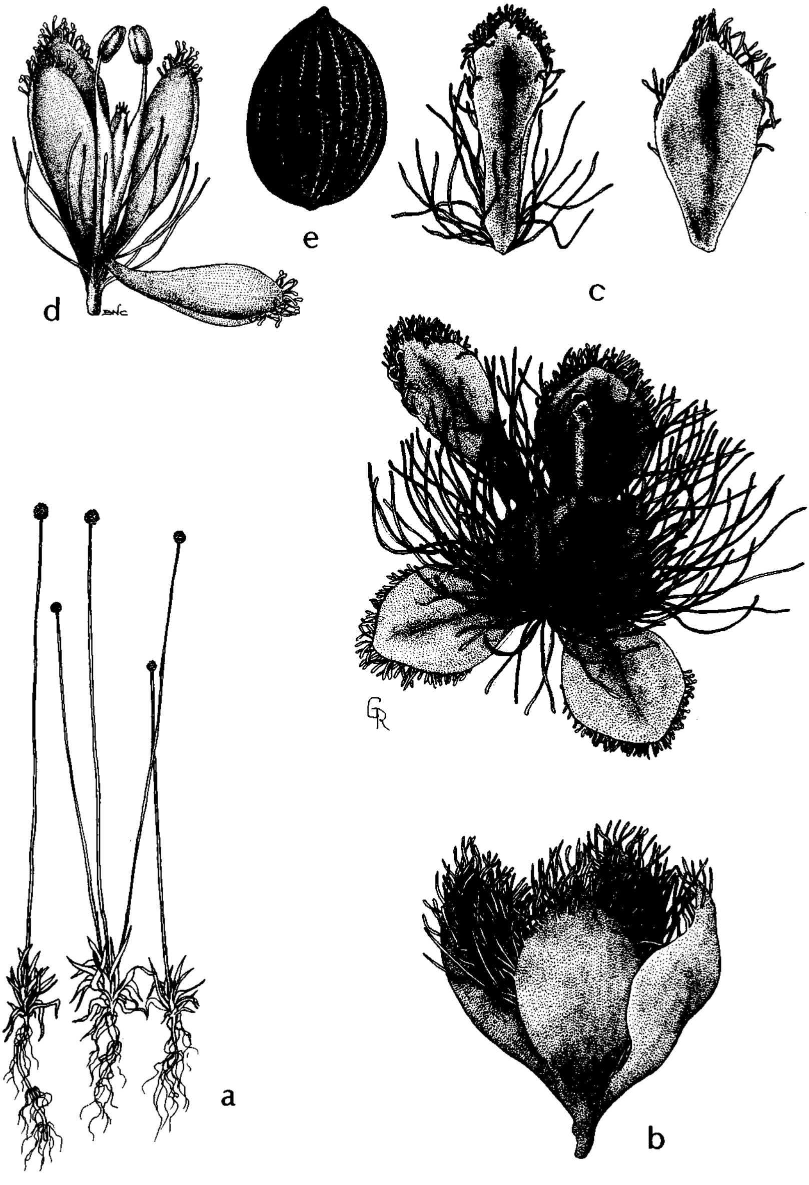

Fig. 306. **Lachnocaulon digynum:** a, habit; b, pistillate flower, unopened below, mature, above; c, left to right: receptacular bract, sepal; d, staminate flower; e, seed.

Pensacola, Florida, has the smallest leaves of all the *Lachnocaulon* of the United States. The small rosettes, densely aggregated on slender ascending rhizomes into bright green, convex tufts of sometimes hundreds of individuals, remind one of some of the larger Polytrichums. The 2-carpellate condition of the gynoecium is consistent throughout all samples of this species so far examined, there being no evidence at all of any aborted third carpel either in the ovulary or in the style branching. The only other species of *Lachnocaulon* which I found in association with this one is *L. anceps*, from which it is readily distinguished in the field by its glabrous or almost glabrous scapes, its shorter stature, and its darker, smaller heads.

3. Syngonanthus

Syngonanthus flavidulus (Michx.) Ruhl. in Engl. Fig. 307

A clump former or solitary, the dense, recurved-leaved, rosettes of crowded leaves on short stems which develop from lateral buds, the roots pale and spongy-thickened, but lacking septae. Leaf bluish green, narrowly linear, 2.0–6.0 cm long, attenuate, broadening gradually toward, then flaring abruptly at the clasping base, almost smooth to densely pubescent with long, pustular-based, multicellular trichomes. Sheath of the scape exceeding the leaf (actually very slightly but seemingly considerably, for the leaves are usually recurved and flattened against the substratum while the scapes are erect), acute or bifid, ascending-pilose, many of the hairs gland-tipped or clavate. Scape 5.0–30.0 cm long, slightly twisted, 5-ridged, with ascending, slight to copious pubescence of long, multicellular, translucent trichomes, many of which have glandular tips. Young flowering heads hemisphaerical, mostly obscured by the straw-colored outer bracts, later becoming globose, gray, chaffy, 5.0–10.0 mm broad. Receptacle densely pilose with long, filiform-acute, translucent trichomes. Longer receptacular bracts oblanceolate, about 2.5–3.5 mm long, straw-colored, acute, sparingly ciliate with filiform, multicellular, acute trichomes. Male flower: sepals 3, spatulate or oblanceolate, ca. 2.0–3.0 mm long, pale, acute, equipped on the backs distally with slender, acute, multicellular, translucent trichomes; receptacle slightly hairy; petals 3, fused into a narrowly funnelform tube ca. 2.5 mm long, pale yellow, the short lobes alternating with the filaments of the stamens: stamens 3, the filaments originating at a disc midway the length of the corolla tube and slightly extending past the corolla rim, the anthers short-oblong, yellowish, seemingly bilocular but actually with 4 locules; staminodia 3, obovoid, yellowish. Female flower: sepals 3, linear, acuminate, ca. 3 mm long, pale, translucent, accrescent, smooth or the backs glabrescent; petals 3, narrowly linear, acute, about the length of the sepals, the tips connivent above the gynoecium, smooth; receptacle and gynophore smooth or hairy, the gynoecium 3-carpellate, 3-locular, 3-ovulate (1 often aborting), the ovules pendulous, the styles 3, unbranched; seeds ellipsoidal, evidently longitudinally and vertically striate, ca. 0.5 mm long, the connecting vertical striae faint but forming evident ladders of alveolae, lustrous.

Moist to rather dry sands, sandy peats or peats of pine flatwoods, lake or pond margins, seepage bogs, ditches, ditch-banks and savannas. Primarily outer coastal plain, (s.e. Va.?), N.C. to Fla., s. Ala.

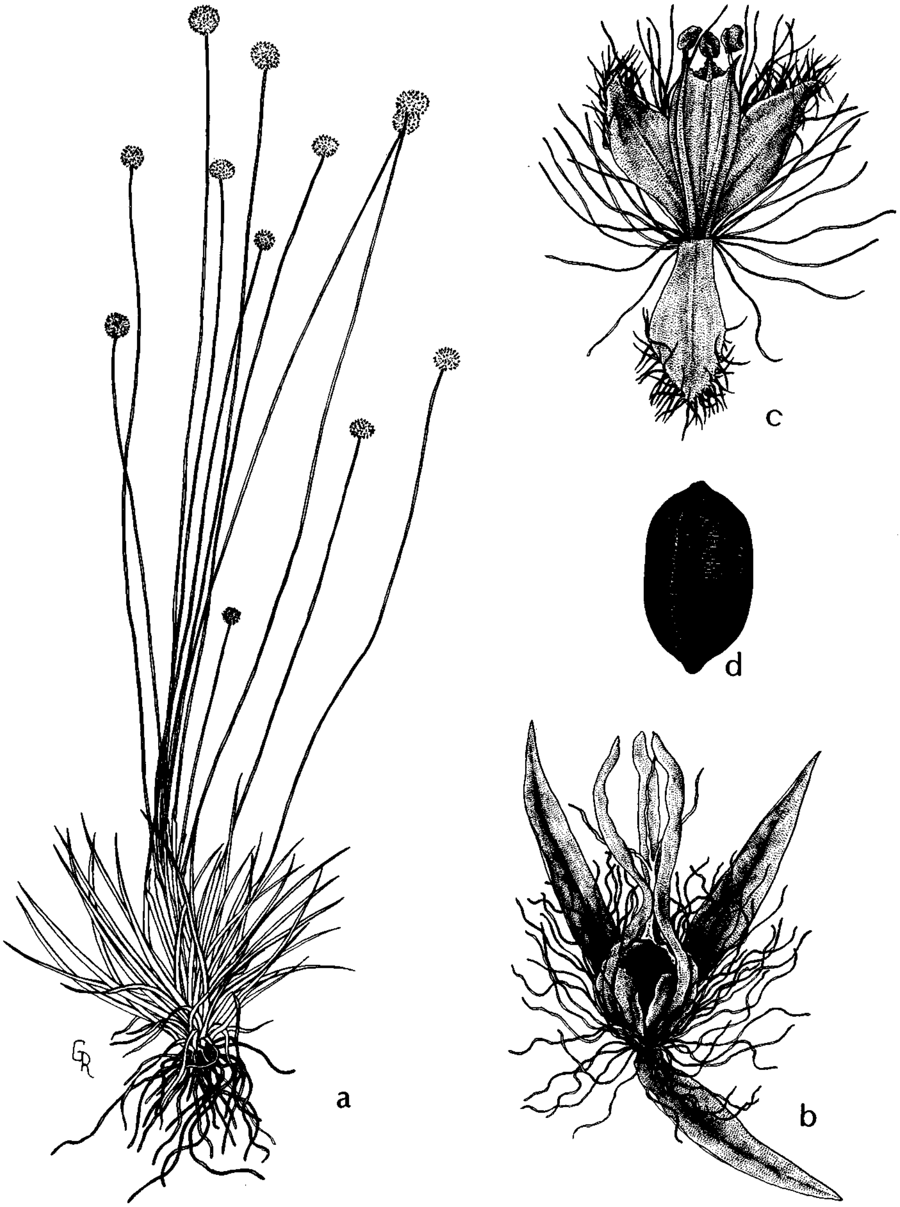

Fig. 307. **Syngonanthus flavidulus:** a, habit; b, pistillate flower; c, staminate flower; d, seed.

Commelinaceae (SPIDERWORT FAMILY)

1. Petals essentially equal; inflorescence subtended by 1–3 foliar bracts.
  2. Functional stamens 2–3; flowers solitary or in short racemes. 1. *Murdannia*
  2. Functional stamens 6 (rarely 5 or 7); flowers in umbellike cymes. 2. *Tradescantia*
1. Petals unequal, the two lateral larger than the medial; inflorescence borne in a closely folded spathe. 3. *Commelina*

1. Murdannia

Annual herbs with subsucculent leafy stems. Leaves alternate, with sheathing bases, the blades linear to linear-oblong, principal veins parallel. Flowers axillary and solitary or in axillary or terminal racemes, radially symmetrical. Sepals membranous, persistent. Petals ephemeral, opening in the morning and lasting but a part of a day, all alike, ovate to obovate. Functional stamens 2–3, alternating with 4 or 3 staminodes. Capsule 2–3-locular, each locule with several seeds.

- Flowers solitary or in 2–4-flowered racemes in the leaf axils. 1. *M. keisak*
- Flowers in terminal, stalked racemes. 2. *M. nudiflora*

1. **Murdannia keisak** (Hassk.) Hand.-Mazz.

Stems usually elongate-prostrate, rooting at the nodes, the distal portions ascending, sparsely glandular-pubescent. Leaf blades glabrous, linear to linear-oblong or narrowly ovate, their bases truncate to somewhat clasping, 2–6 cm long and to 10 mm wide, acute apically. Flowers short-stalked, mostly solitary in the upper leaf axils, sometimes in 2–4-flowered short racemes. Sepals ovate-oblong, 5–6 mm long, $^2/_3$ the length of the capsule, pubescent on the outer surface at the apex. Petals pink to lilac-purplish, about 8 mm long. Capsule oval, abruptly narrowed to a point at the summit. Seed ovate-oblong, somewhat irregular in outline, about 3 mm long, with a thin, outer rough grayish coat which sloughs, reddish brown beneath the coat. (*Aneilema keisak* Hassk.)

Native in e. Asia. Often forming dense mats, sometimes in shallow water, marshy shores, marshes, borders of swamps, drainage ditches and canals. S.e. Va. to n. Fla.

2. **Murdannia nudiflora** (L.) Brenan.

Annual herb, unbranched to many-branched from near the base, the bases of the branches commonly decumbent and rooting at a few nodes, then erect-ascending, mostly 1–3 dm tall, sparsely pubescent just below the nodes. Leaf sheaths ciliate on the margins, blades linear-oblong, acute apically, 3–10 cm long, 3–8 mm wide, the base of the blade marginally ciliate. Flowers in a stalked, short, rounded raceme from the uppermost node, sometimes another raceme from the next node below, rarely 2 at a node, the stalks of the raceme 1–4 cm long, the flower stalks mostly 2–5 mm long. Sepals elliptic, hyaline, rounded at the summit, nearly as long as the mature capsule. Petals bluish lavender to purple. Capsule broadly oval, apiculate, about 4 mm long, green and lustrous. Seeds subhemispheric, about 1 mm in both dimensions, reddish brown, tuberculate. (*Aneilema nudiflorum* (L.) Kunth)

Native in Asia. Naturalized and weedy; wet clearings, ephemeral pools, wet spoil banks or flats, lawns and gardens, alluvial outwash. S.e. N.C. to s. Fla., w. to s. Tex.; parts of trop. Am.

2. Tradescantia

Tradescantia fluminensis Vell. WANDERING-JEW.

Perennial herb with much branched, subsucculent, glabrous stems, extensively creeping and rooting at the nodes, the secondary branches ascending-erect. Leaves alternate, with sheathing bases, the blades with the principal veins parallel, ovate or ovate-oblong, 2–6 cm long, 1.5–2 cm wide, rounded or broadly cuneate basally, acute or short-acuminate apically, glabrous above, somewhat scurfy below, margins smooth or short-pubescent, summit of the sheath ciliate. Flowers in umbellike cymes terminating the branches, cymes subtended by foliar bracts. Flowers ephemeral, opening in the morning, lasting but a part of a day, radially symmetrical, on stalks 8–14 mm long. Sepals ovate, elliptic, or lanceolate, acuminate apically, 6 mm long, ciliate on the midrib. Petals 3, spreading, white, lance-elliptic to oval, 8–10 mm long. Stamens usually 6, sometimes 5 or 7, the filaments membranous, hyaline-winged and bearing numerous, jointed-cellular, white trichomes as long as the filaments. Fruit a loculicidal capsule with 1–2 seeds per locule. Seeds subellipsoid, somewhat pitted-reticulate, about 1.5 mm long.

Native to S.Am. Naturalized locally, sometimes very abundantly and to the virtual exclusion of native herbs, in bottomland wet woodlands and floodplain forests. N. Fla., probably elsewhere in our range.

3. Commelina (DAYFLOWER, WIDOW'S TEARS)

Herbaceous annuals or perennials with subsucculent stems. Leaves alternate, sheathing the stems below, the blades ovate to linear, principal veins parallel. Inflorescence a cyme, closely subtended and essentially enclosed by a closely folded, oblique spathe. Flowers of a given cyme at anthesis on successive days, or perhaps at several-day intervals, exserted from the spathe at anthesis (stalks of the buds recurved and the buds enclosed by the spathe, stalks straighten as anthesis proceeds, the open flower exserted, then the stalks recurved again after the corolla disintegrates pulling the "juicy mess" back into the spathe). Stamens 6 (–5), three with oblong fertile anthers, three smaller staminodes with crosslike rudimentary anthers, filaments glabrous. Ovary 3-locular, the upper median locule smaller, 1-ovuled or abortive and empty, or obsolete, the lower 2 locules with 1–2 ovules each. Fruit a loculicidal capsule.

1. Margins of the spathe free above (adaxial side) all the way from the base to the tip.
  2. Lateral petals blue, median petal white; anthers 6. 1. *C. communis*
  2. Lateral and median petals blue; anthers 5. 2. *C. diffusa*
1. Margins of the spathe free from the tip across the top, united on the more or less vertical basal portion nearest the stalk. 3. *C. virginica*

1. Commelina communis L.

Annual herb. Stems usually erect at first, later branching rather profusely, decumbent below and rooting at the nodes, secondary branches ascending. Leaf blades lanceolate to ovate-lanceolate, mostly 5–10 cm long, 1–3 cm wide, cuneate to rounded or subcordate basally, acute apically, glabrous below, glabrous or somewhat pubescent above, sheaths glabrous to variously pubescent, their margins or summits sometimes ciliate. Spathe, in side view, broadly rounded or subcordate at the base, the lower (abaxial) edge straight to arched, the upper (adaxial) edge gradually curved from base to tip, margins not at all united adaxially, tip acute to short-acuminate. Lateral petals blue, medial smaller and white. Seeds rugose, 3.5–4 mm long.

Native to Asia. Naturalized on stream banks, bottomland woodlands, gardens, occasional in swamps, wet clearings. Mass. to Wis., s. to Fla. and e. Tex.

2. Commelina diffusa Burm. f.

Annual, in general features much like the preceding. All petals blue. Seeds 3.5 mm long, nearly ellipsoid, pitted-reticulate. (*C. longicaulis* Jacq.; incl. *C. caroliniana* Walt.)

Wet woodlands, floodplain forests, stream banks, marshes, moist fallow fields. Del. and e. Va. to s. Ill., Mo. and e. Kans., s. to s. Fla. and e. and s. Tex.; pantropical.

3. Commelina virginica L.

Coarser than either of the preceding. Perennial with slender rhizomes. Stem erect, often unbranched, if branched, usually few-branched above, 4–12 dm tall. Leaf sheaths usually closely clasping the stem, long-cylindric, sometimes loose at the summit, pubescent on the surface, at the summit bearing numerous, conspicuously jointed-cellular, stiffish, brown or amber-brown trichomes; blades lanceolate to broadly lanceolate, rounded to cuneate basally, the larger mostly acuminate apically, smaller ones acute; larger blades 1–2 dm long, 2–5 cm wide, scabrous above. Spathes congested; in side view the base nearly vertical, straight-horizontal to somewhat arched downward on the lower side, oblique on the upper, the margins united only along the vertical base. Petals blue. Seeds about 4–6 mm long, reddish or grayish brown, smooth or finely pubescent.

Floodplain forests, wet woodlands, wet thickets, river banks. S. N.J., s. Pa., to s. Ill., Mo. and Kans., s. to n. Fla. and e. Tex.

Pontederiaceae (PICKERELWEED FAMILY)

1. Leaf blades suborbicular to broadly elliptic, base widely cuneate; petiole usually inflated. 1. *Eichhornia*

1'. Leaf blades ovate to lanceolate or reniform, base cordate to truncate or linear and sessile; petiole not inflated.

  2. Leaves cordate to deltoid-ovate, triangular-lanceolate, to lanceolate; flowers 2-lipped; stamens 6. 2. *Pontederia*

  2. Leaves linear or round-reniform; flowers radially symmetrical; stamens 3. 3. *Heteranthera*

1. Eichhornia

Eichhornia crassipes (Mart.) Solms. WATER-HYACINTH. Fig. 308

Floating aquatic herb (sometimes stranded in mud and appearing rooted). Leaf blades suborbicular, ovate, or broadly elliptic. Petiole usually spongy-inflated. Inflorescence pedunculate, spicate, from a spathe. Perianth 2-lipped, showy, blue with yellow streaks; stamens 6, the upper 3 included, lower 3-exserted. Stigmas 3. Capsule 3-celled, many seeded. (*Piaropus crassipes* (Mart.) Britt.)

Ponds, canals, rivers, ditches, impoundments; clogging waterways in s. U.S. Va. to s. Fla., w. to Mo., Tex.; Calif.; W.I. Native of Brazil.

2. Pontederia

Pontederia cordata L. PICKERELWEED.

Aquatic or marsh herb with creeping rhizomes rooted in the substrate. Leaves basal, erect, long petioled, cordate-ovate to lanceolate, obtuse. Inflorescence pedunculate originating from uppermost part of a stem bearing a single leaf. Perianth 2-lipped, blue, marked with yellow; stamens 6, 3 exserted, 3 included. Stigmas 1–2. Fruit with wall formed from floral tube, ridged, tooth-crested. Seeds solitary.

- Mature floral tube essentially glabrous, shaggy-pubescent in the bud stage. var. *cordata*
- Mature floral tube persistently pubescent with glandular hairs. var. *lancifolia*

Pontederia cordata L. var. **cordata.** Fig. 309

Leaf blades deltoid-ovate to triangular-lanceolate with bases deeply cordate to truncate (rarely narrowed at the base). Young floral tube villous, becoming essentially glabrous or rarely sparsely glandular.

Marshes, streams, ditches, shallow water of ponds and lakes. P.E.I. to Ont. and Minn; generally southward to Fla. and Tex.; C.Am., S.Am.

Pontederia cordata var. **lancifolia** (Muhl.) Torrey. Figs. 310 and 311

Leaf blades narrowly to broadly lanceolate, bases typically not lobed. Mature perianth pubescent with short glandular hairs. (*P. lanceolata* Nutt.)

Marshes, swamps, streams, ditches, shallow water of ponds and lakes. Tenn., S.C., s. Ga., Fla., s. Ala.; e. Tex.; sporadic northward; W.I.; S.Am.

In our range the variation in *Pontederia* is very great especially in southern Georgia and throughout Florida. This is the principal area of overlap of the two varieties, and we have no great confidence in our own ability satisfactorily to distinguish them in many instances.

3. Heteranthera (MUD-PLANTAINS)

Aquatic herbs, floating, submerged or rooted in substrate, with simple or branched

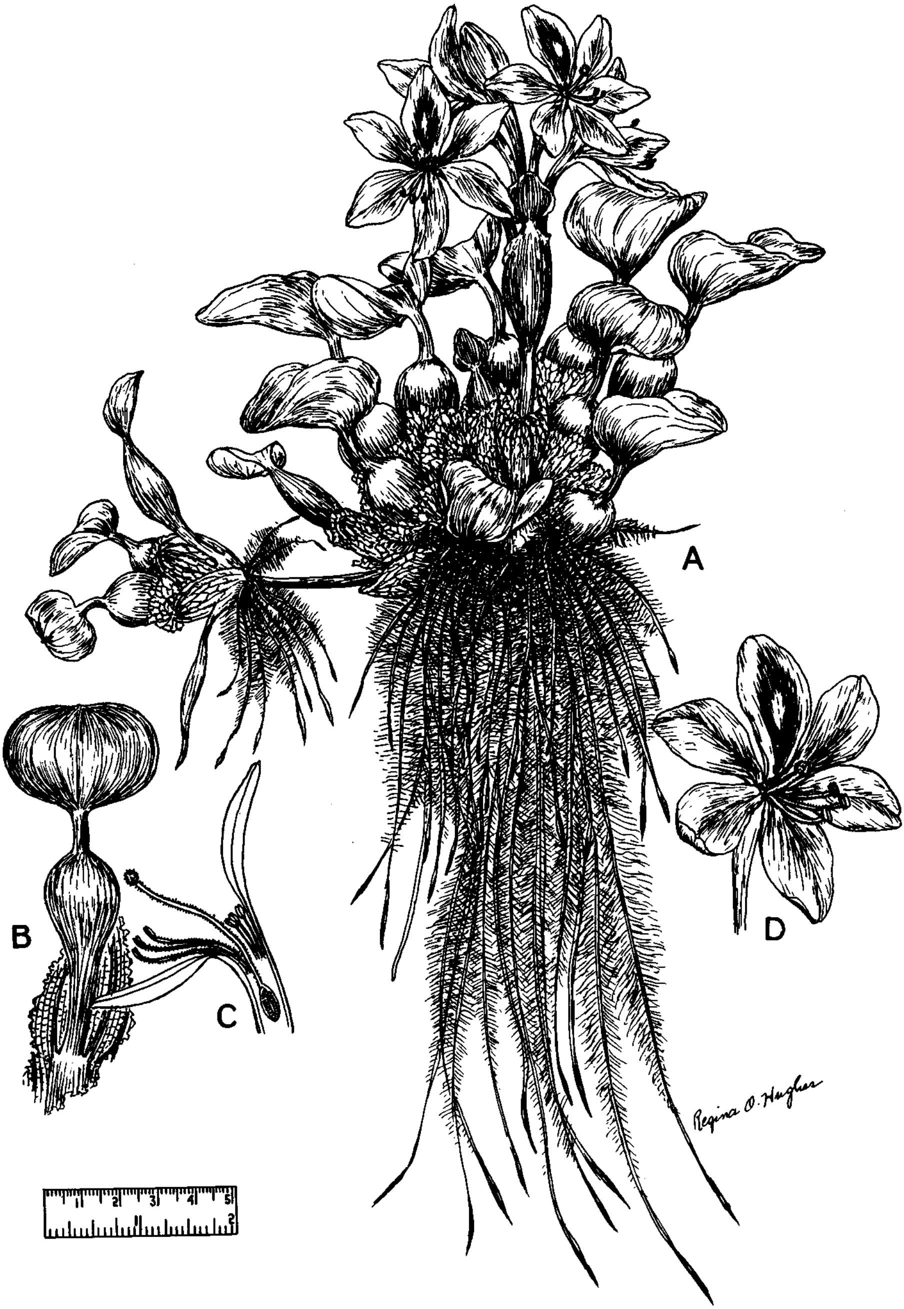
A
B
C
D
1
2
3
4
5
1
2
Regina O. Hughes

Fig. 308. **Eichhornia crassipes:** A, habit; B, leaf; C, longitudinal view of flower, diagrammatically; D, flower. (From Reed, *Selected Weeds of the United States* (1970) Fig. 49)

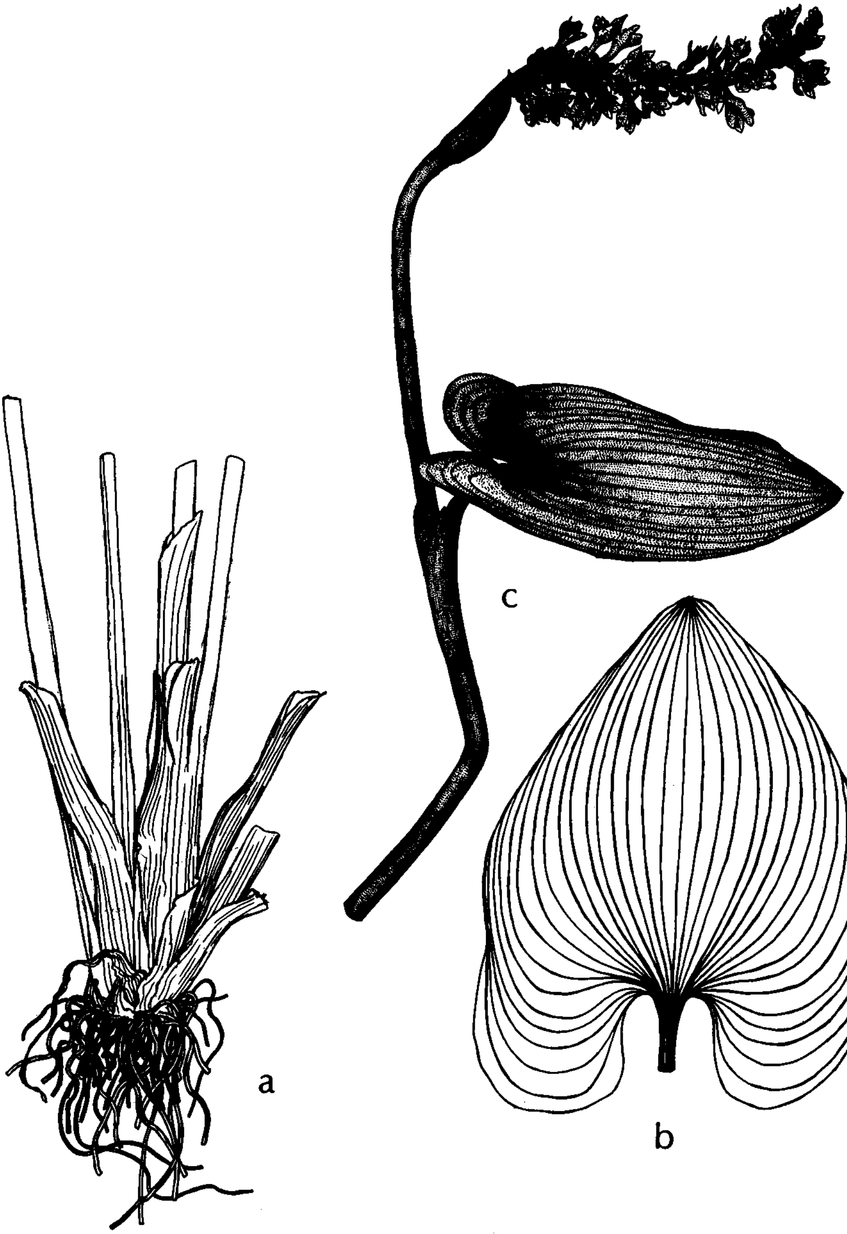

Fig. 309. **Pontederia cordata** *var.* **cordata:** a, base of plant; b, leaf; c, upper portion of flowering stem with bracteal leaf and inflorescence.

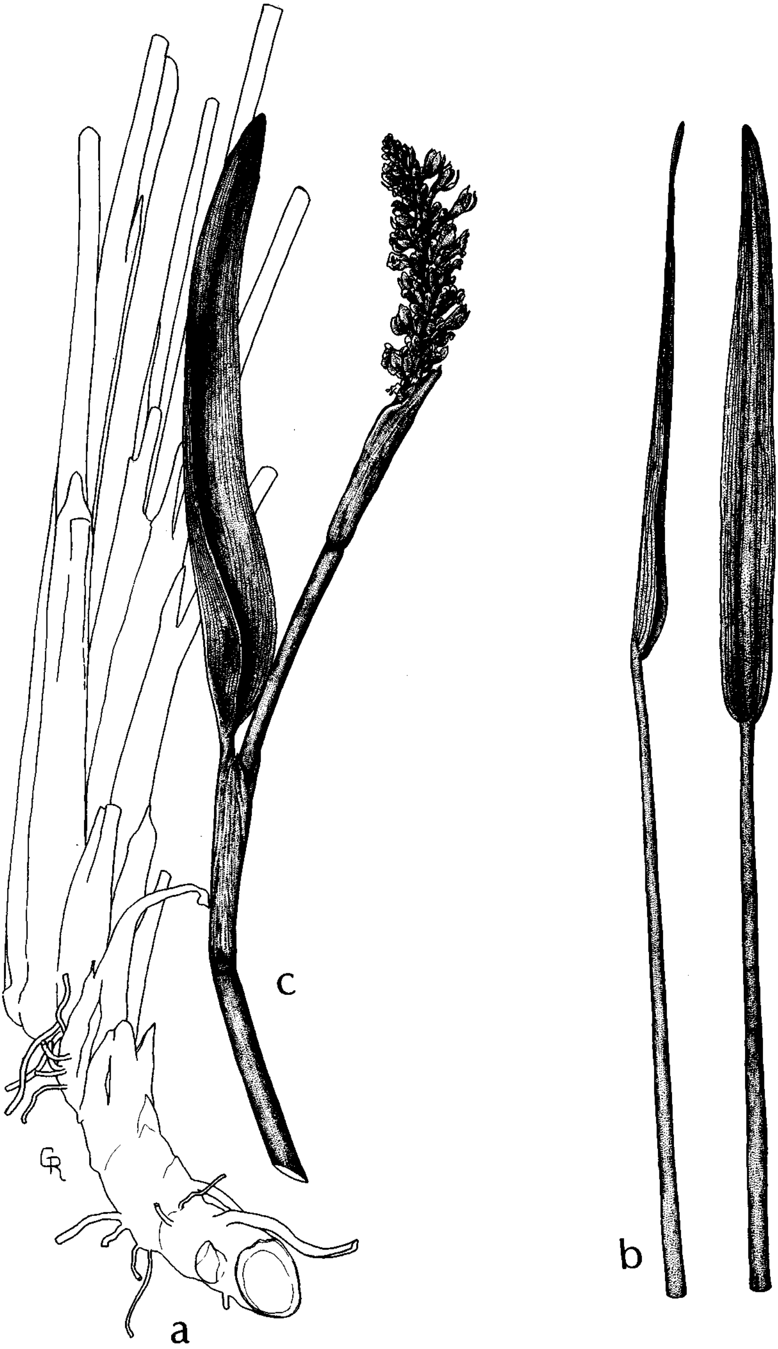

Fig. 310. **Pontederia cordata** *var.* **lancifolia:** a, base of plant; b, leaves; c, upper portion of flowering stem with bracteal leaf and inflorescence.

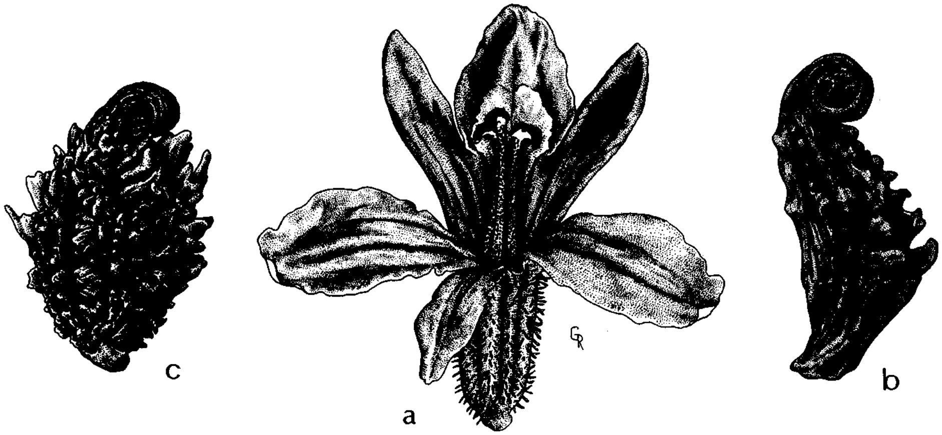

Fig. 311. **Pontederia cordata** *var.* **lancifolia:** a, flower; b, early stage of developing fruit with coiled old perianth tube at the summit (side view); c, mature fruit with coiled old perianth tube at the summit (face view).

stems. Leaves alternate or in a rosette, sheathing at base. Flowers 1–several, sessile, from a spathe. Perianth of 2 series of 3 parts each, the outer narrower, surmounting a floral tube and rotately spreading. Stamens 3. Fruit a many-seeded capsule.

• Leaves round-reniform, petiolate; flowers white or pale blue.	1. *H. reniformis*
• Leaves linear, sessile; flowers yellow.	2. *H. dubia*

1. Heteranthera reniformis R. & P. Fig. 312

Plant creeping in substrate or floating. Leaves in a rosette, petioled, the blades cordate-reniform, usually wider than long; petioles 3–15 cm long. Flowers 3–10, inserted in a short-peduncled spathe, perianth white or usually pale blue.

In shallow water of streams, marshy areas. Conn., e. N.Y. to Ill., Mo., Nebr., s. to Fla., Tex.; trop. Am.

2. Heteranthera dubia (Jacq.) MacM. WATER STAR-GRASS. Fig. 313

Plant submersed. Leaves linear, sessile, alternate from a slender branching stem, without a distinct midvein; sheath tipped on each side with small acute stipulelike structures. Flower solitary, exserted from terminal spathe, exposed above the water; perianth pale yellow. (*Zosterella dubia* (Jacq.) MacM.)

Streams and quiet waters. Que. and Ont. w. to Oreg., generally southward more or less throughout the U.S.; Mex.

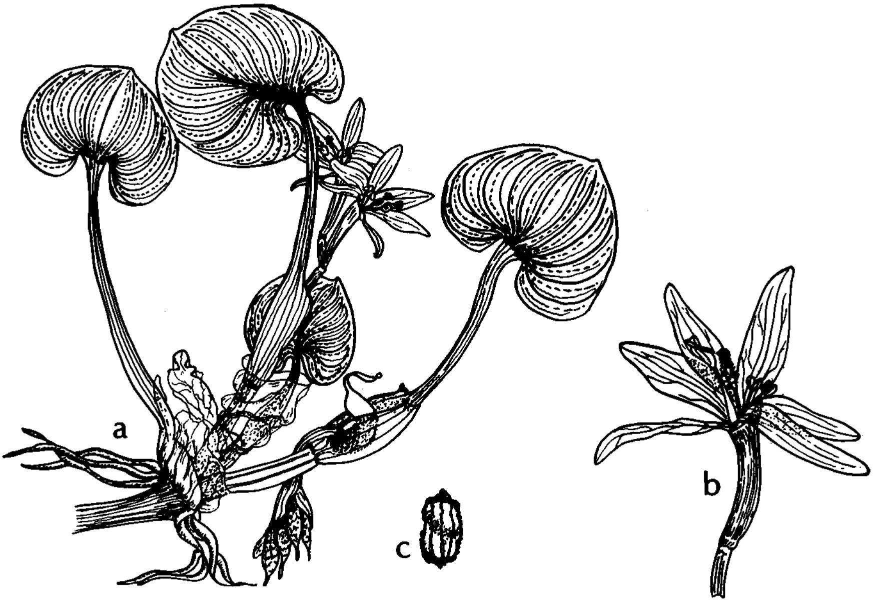

Fig. 312. **Heteranthera reniformis:** a, habit, portion of plant; b, flower; c, seed. (From Correll and Correll)

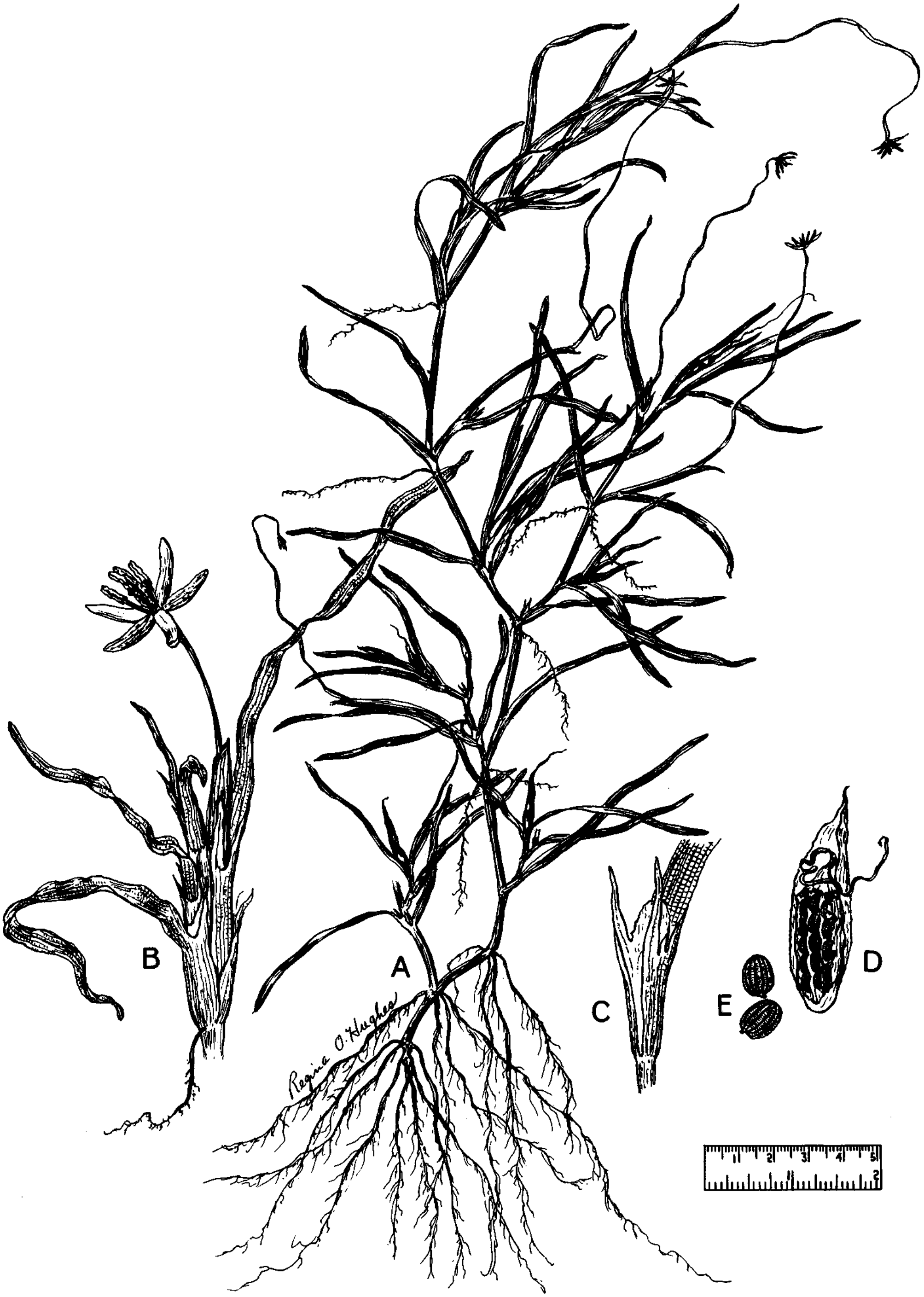
B
A
C
E
D
Regina O. Hughes
1 2 3 4 5
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Fig. 313. **Heteranthera dubia:** A, habit; B, enlarged portion of habit showing flower; C, leaf sheath; D, capsule; E, seeds. (From Reed, *Selected Weeds of the United States* (1970) Fig. 50)

Juncaceae (RUSH FAMILY)

- Plants glabrous throughout; capsule with many very small powderlike seeds. 1. *Juncus*
- Plants more or less hairy; capsule with 3 seeds. 2. *Luzula*

1. Juncus (RUSHES, BOG RUSHES)

Grasslike herbs of moist or wet places generally. Two (of our) species annual, others perennial, the latter commonly with rhizomes, many kinds perennating in such a way as to form clumps or tussocks which enlarge year after year; some have elongate rhizomes and colonize extensive areas. Flowering stems seldom branched. Leaves sheathing, the sheaths open longitudinally, bladeless (rarely) or bearing blades. Inflorescence terminal, in some a subtending bract appears like a continuation of the stem, the inflorescence thus appearing lateral. Flowers in simple to very diffuse compound cymes, in many the ultimate cymes glomerate. Flowers hypogynous, green to brown, reddish, or almost reddish black; individually small, not showy, the perianth of 2 whorls of 3 distinct but similar bractlike persistent segments. Stamens 6 or 3. Gynoecium of 3 fused carpels, style short and bearing 3 recurved stigmas. Ovary 1-locular or 3-locular by intrusion of the parietal placentae. Fruit a loculicidal 3-valved capsule. Seeds numerous, tiny and powderlike to the naked eye.

Until one has a very considerable familiarity with the kinds of rushes of a given local area, identification is achieved with no little difficulty. It is important to have specimens at or very nearly at maturity, with ripe capsules and seeds. In some cases attributes of underground parts are especially diagnostic.

1. Principal bract of the inflorescence erect and exceeding the inflorescence, the latter thus appearing lateral.
  2. Flowers or fruits borne in compact clusters of 2–6 on a much branched cyme. 1. *J. roemerianus*
  2. Flowers or fruits borne singly on the axes of the cyme or in a single compact cluster.
    3. Sheaths without blades; capsules 3-sided.
      4. Perianth segments equalling the capsule, all sharp pointed; capsule broadly rounded to emarginate at the summit. 2. *J. effusus*
      4. Perianth segments distinctly shorter than the capsule; the outer sharp pointed, the inner obtuse or rounded; capsule tapering at the summit and apiculate. 3. *J. gymnocarpus*
    3. Sheaths, or some of them, bearing elongate blades; capsules subglobose. 4. *J. coriaceous*
1. Principal bract of the inflorescence shorter than to exceeding the inflorescence but not appearing as a continuation of the stem.
  5. Flowers or fruits borne singly on the inflorescence axes.
    6. Length of the individual inflorescence more than half the height of the plant; annual and not exceeding 3.5 dm high. 5. *J. bufonius*
    6. Length of the individual inflorescence much less than half the height of the plant or, if otherwise, perennial and much taller.
      7. Capsules tapering gradually into the beak; inflorescence usually very diffuse, flexuous and delicate. 6. *J. abortivus*
      7. Capsules with the summits rounded, retuse or very abruptly narrowed into a beak; inflorescence not diffuse, its branches relatively stiff.
        8. Margins of leaf sheaths submembranous, friable, whitish-hyaline, the summit with tonguelike auricles. 7. *J. tenuis*
        8. Margins of leaf sheaths firm and subcoriaceous, the summit with short-tapering or rounded auricles. 8. *J. dichotomus*
  5. Flowers or fruits borne in close clusters or head-like or glomerate clusters of 2–many.
    9. Leaf blade without cross partitions.
      10. Plants annual.
        11. Stems filiform and bearing a single capitate cluster of 2–several flowers, or sometimes a second cluster above the first. 9. *J. capitatus*

11. Stems wiry and bearing several curved glomerules. 5. *J. bufonius*

10. Plants perennial.

12. Stems soft and weak, commonly creeping and rooting at the nodes, often proliferating and forming extensive mats in shallow water. 10. *J. repens*

12. Stems erect and with hard bases.

13. Perianth parts at maturity straw-colored; capsule yellowish to light brown; glomerules 1–5, rarely to 10 per stem, globose to subhemispherical. 11. *J. filipendulus*

13. Perianth parts at maturity reddish brown; capsule dark reddish brown; glomerules commonly very numerous, rarely less than 10, subhemispherical to turbinate. 12. *J. marginatus*

9. Leaves with cross partitions as seen in longitudinal section (or as harder or darker rings as seen surficially).

14. Seeds with definite long taillike extremities formed by the enveloping membrane.

15. Capsule much exceeding the perianth.

15a. The capsule tapered gradually to the tip. 13. *J. trigonocarpus*

15a. The capsule abruptly contracted to a short-beaked tip. 13a. *J. brachycephalus*

15. Capsule and perianth about equal in length, or capsule only slightly exceeding the perianth. 14. *J. canadensis*

14. Seeds with blunt, abruptly pointed, or short-tapering extremities.

16. Capsule abruptly contracting at the summit.

17. Capsule one-half to two-thirds as long as the perianth. 15. *J. brachycarpus*

17. Capsule equalling the perianth or longer.

18. Capsule much longer than the perianth, from one-third longer to twice as long or more.

19. The capsule one-third longer than the perianth, 2.3–3.0 mm long. 16. *J. debilis*

19. The capsule twice as long as the perianth or longer, 4–5 mm long. 17. *J. diffusissimus*

18. Capsule equalling or just exceeding the perianth.

20. Leaf blades with prominent and conspicuous ringlike bands at the position of the cross partitions. 18. *J. nodatus*

20. Leaf blades with faintly marked ringlike bands at the position of the septae.

21. Roots (some) with fusiform tubers terminally. 19. *J. elliottii*

21. Roots not tuber-bearing. 20. *J. acuminatus*

16. Capsule gradually tapering to the summit.

22. Capsule twice as long as the perianth or longer; flowers mostly 2–4 in turbinate glomerules. 17. *J. diffusissimus*

22. Capsule equalling the perianth or only the tip exceeding it; flowers numerous in spherical heads or lobed heads.

23. Blades of lower leaves laterally flattened.

24. The blades of the lower leaves with incomplete septae; glomerules of the inflorescence spherical, about 10 mm across; valves of the capsule after dehiscence remaining united at their tips. 21. *J. polycephalus*

24. The blades of the lower leaves with complete septae; glomerules of the inflorescence spherical, (10–) 12–15 mm across; valves of the capsule after dehiscence spreading, free. 22. *J. validus*

23. Blades of lower leaves terete.

25. Uppermost stem leaf (not the bract of the inflorescence) with a blade very much longer than its sheath, reaching the inflorescence or overtopping it. 23. *J. torreyi*

25. Uppermost stem leaf a bladeless sheath or with a blade to as long as its sheath or a little longer, not reaching the inflorescence.

26. Inflorescence glomerules spherical, mostly suffused with reddish brown or purplish red pigment; uppermost leaf (first one below the inflorescence bract) with blade much shorter than its sheath; perennating by basal offshoots. 24. *J. megacephalus*

26. Inflorescence glomerules sometimes spherical, commonly lobed, not suffused with reddish pigment but dull brown at maturity; uppermost leaf (first one below the inflorescence bract) equaling or longer than its sheath; perennating by stoutish pale rhizomes. 25. *J. scirpoides*

1. **Juncus roemerianus** Scheele. NEEDLE RUSH. Fig. 314

Stems from vigorous, long, scaly rhizomes, to 1.5 m tall, grayish green. Basal leaf

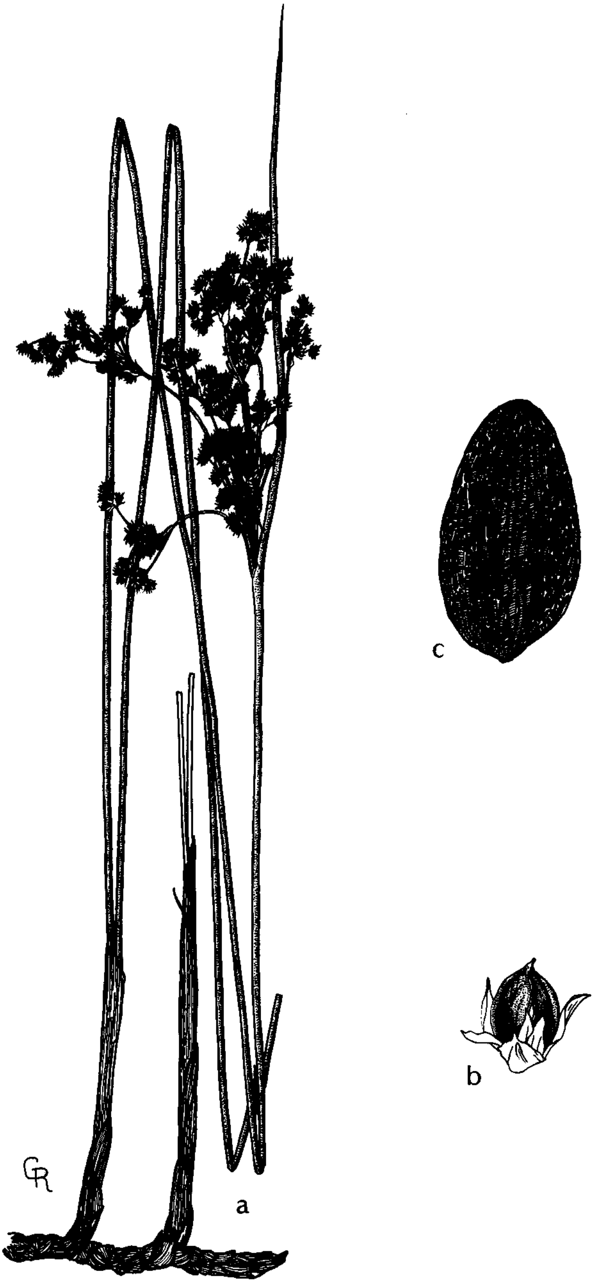


Fig. 314. **Juncus roemerianus:** a, plant; b, perianth and capsule; c, seed.

sheaths mostly bladeless, the upper bearing erect, rigid, terete blades about as long as the flowering stems, the tips very sharp pointed. Principal bract of the inflorescence erect, usually exceeding the cyme, very sharp pointed. Cyme with stiffish, usually erect, principal branches the flowers and fruits on the ultimate branches in compact clusters of 2–6. Outer perianth segments longer than the inner, keeled, acuminate, the inner flat or only slightly keeled, obtuse or acute. Capsules oblong to obovoid, abruptly short-apiculate, 3-sided, dark brown and lustrous, 2–3 mm long. Seeds ovoid to oblong, the extremities rounded to slightly oblique, dark brown, under high magnification reticulate, the alveolae much longer than broad, longitudinally oriented.

In coastal tidal marshes, frequently in vast solid stands with a characteristic grayish hue. Md. to s. Fla., w. to s.e. Tex.

2. **Juncus effusus** L. SOFT RUSH. Fig. 315

Stems from vigorous scaly rhizomes, forming large tussocks, bright green, to 1.5 m tall or a little more. Leaf sheaths bladeless, bristle-tipped. Stems stout and relatively soft, terete, finely many-striate. Principal inflorescence bract erect, extending much beyond the cyme, sharp pointed but flexuous. Flowers and fruits in much branched but relatively compact clusters, borne mostly singly on the axes. Perianth segments equal in length and about equalling the capsule, the outer keeled, the inner flat, all pointed. Capsules obovoid, 3-sided, rounded to emarginate at the apices, mostly 2–2.5 mm long, light brown and lustrous. Seeds irregularly oblique, linear-oblong to elliptic, finely reticulate, usually with a straight to twisted longitudinal ridge, amber with darker short-pointed extremities.

Cosmopolitan. Fresh water marshes, shores, meadows, sloughs, wet depressions, wet alluvial outwash.

A variable species with several described varieties. In our range much the commonest is the variety *solutus* Fern. & Wieg. which is presumably as described above.

3. **Juncus gymnocarpus** Coville. Fig. 316

Conspicuously scaly-rhizomatous and forming extensively spreading clones. Leaf sheaths bladeless, apiculate or short bristle-tipped. Stems slender, terete, flexuous, finely many-striate, dark green. Principal inflorescence bract erect, very much exceeding the cyme, pointed but flexuous. Flowers and fruits in loose cymes with several flexuous main branches, borne singly on the axes. Perianth segments about half the length of the capsule, the outer somewhat keeled, acuminate, the inner flat, obtuse to rounded. Capsules 3-sided, ovate, tapering toward the apiculate summit, about 3 mm long, dark brown and lustrous, opening tardily. Seeds very irregularly oblique and angular, often with a longitudinal ridge, from about as broad as long to twice as long as broad, amber with dark extremities.

Chiefly in water of acid swamps where it may cover much of the swamp area. Local, mountains of e. Pa. to N.C. and Tenn; coastal plain of s.e. Ala. and n. cen. Panhandle, Fla.

4. **Juncus coriaceous** Mack. Fig. 317

Densely cespitose. Some sheaths bladeless and bristle-tipped, others bearing slender, subterete blades of variable lengths. Stems terete, slender and flexuous, erect to reclining. Principal inflorescence bract erect, much exceeding the cyme, slender, terete or nearly so. Cymes sometimes with a few flowers or fruits in a compact glomerule; more commonly the cyme loose and several branched. Perianth segments subequal in length, or the outer longer, usually exceeding the capsule, not keeled, their apices acuminate, sharp. Capsule subglobose or globose, apiculate, 3–4 mm long, light brown and lustrous, tardily dehiscent. Seeds more or less obovate, asymmetrical, dark reddish brown and lustrous, varyingly reticulate, the longitudinal ridges somewhat beaded, the base narrowed to a point, the apex strongly oblique in one view, symmetrical in the other. (*J. setaceous* of authors not Rostk.)

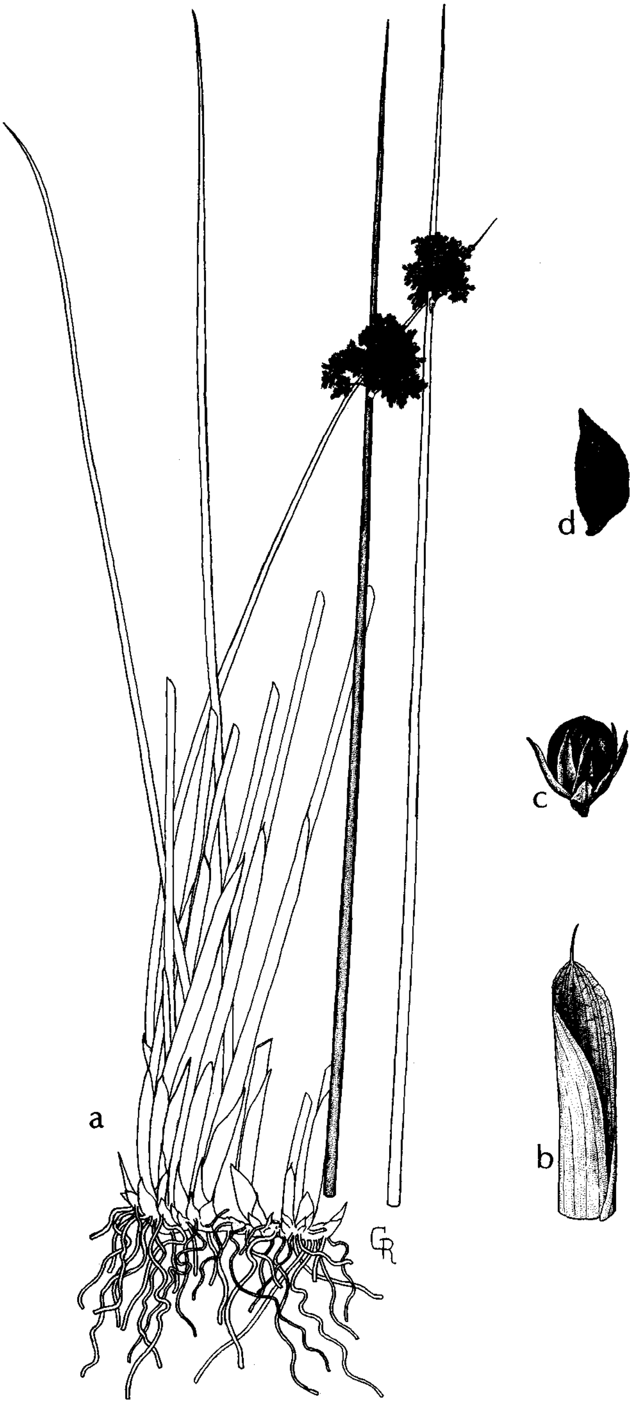


Fig. 315. **Juncus effusus:** a, plant; b, leaf sheath; c, perianth and capsule; d, seed.

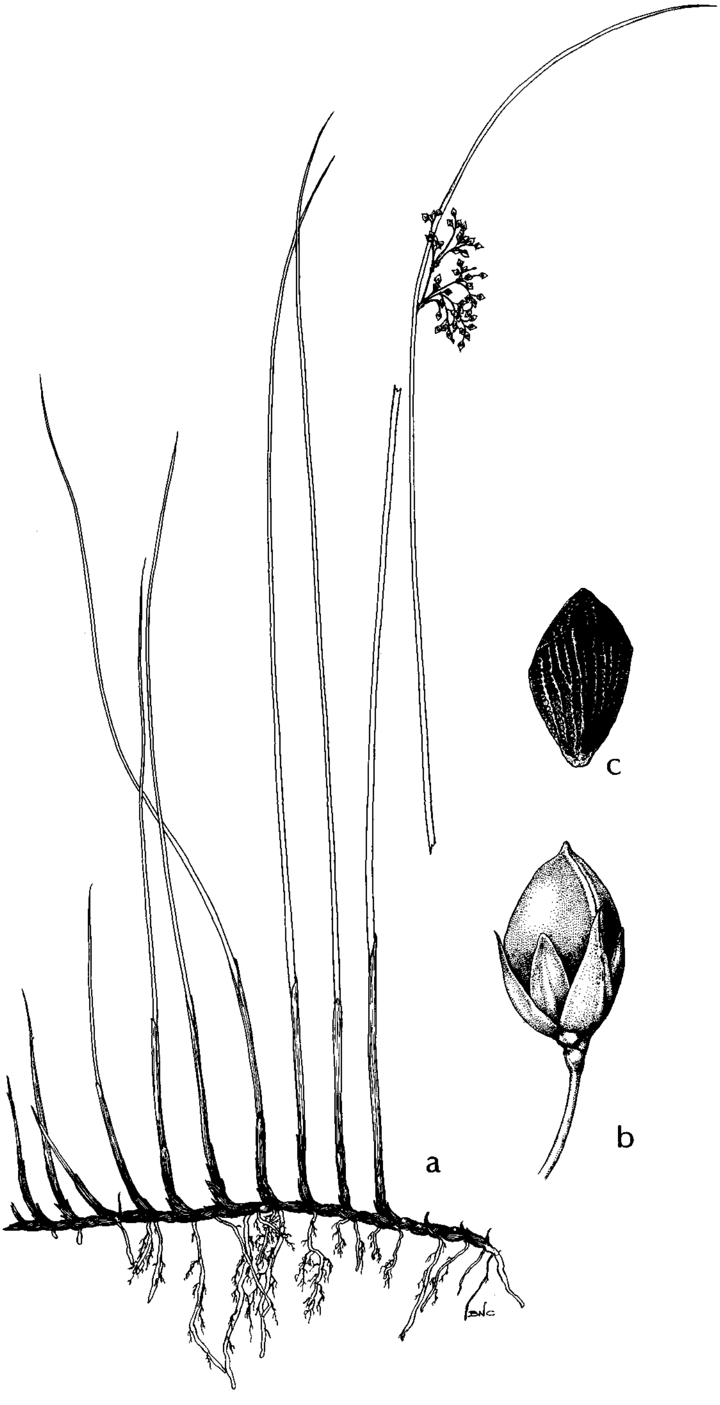


Fig. 316. **Juncus gymnocarpus**: a, habit; b, perianth and capsule; c, seed.

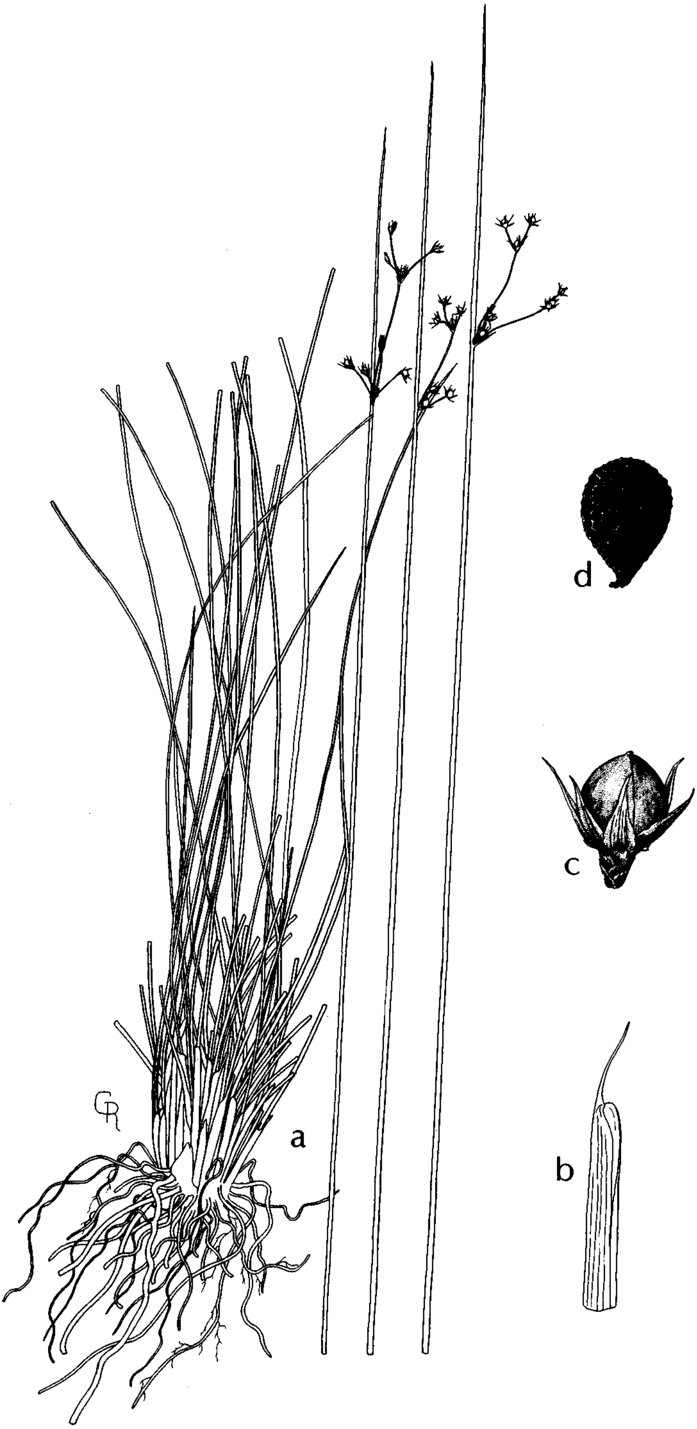


Fig. 317. **Juncus coriaceus:** a, habit; b, leaf sheath; c, perianth and capsule; d, seed.

Swamps, springy wet woodlands and clearings, marshy shores, flatwoods depressions. S. N.J. to n. Fla., w. to e. Tex., n. to Okla., Ark. and Ky.

5. Juncus bufonius L. TOAD RUSH. Fig. 318

Annual, tufted. Leaf sheaths bearing flat or involute blades shorter than the stems. Stems to 3.5 dm high, usually less, several times branched, often from the base or near the base, the overall cymes broad and spreading. Flowers borne individually on the axes, or in turbinate clusters, or in secund often scirpoid clusters. Outer perianth segments somewhat longer than the inner, their ribs greener and more pronounced, the tips more subulate; all exceeding the capsule, with broad hyaline margins, the tips of the inner more hyaline than those of the outer. Capsule 3-sided, oblong, abruptly short-pointed, dark reddish brown, slightly over 3 mm long. Seeds fairly uniform, plump oval-oblong, some of them somewhat asymmetrical, amber except for the darker extremities, sublustrous, very, very finely lined-reticulate.

Open wet sands, sandy alluvium, moist roadsides, ephemeral pools. Semicosmopolitan.

6. Juncus abortivus Chapm. Fig. 319

Perennial with knotty rhizomes, forming clumps and colonies. Leaf sheaths bearing terete blades much shorter than the inflorescences. Stems erect, slender, mostly 6–7 dm tall, the cymes widely branched, the branches filiform-flexuous. Flowers borne 1–3 in the forks and for the most part singly along one side of the branches. Perianth segments about equal in length, obtuse to acute, the beak of the capsule exserted. Capsule 3-sided, lance-acuminate, about 3 mm long. Seeds relatively few per capsule, usually 5–8, oval-oblong, reticulate, dark brown. (Many flowers sterile and producing long, narrow, pointed bulblets.)

In wet sands, often in water, shores of lakes, ponds, and streams, sometimes in flowing water of shallow streams, muck of *Hypericum* ponds, interdunal flats. S.e. Va., to Panhandle of Fla.

7. Juncus tenuis Willd. PATH RUSH. Fig. 320

Perennial with close basal offshoots and forming small tufts or tussocks. Some lower leaf sheaths bladeless and bristle-tipped; mostly bearing flat or involute blades about half or more as long as the stems; with broad, thin, white-hyaline margins prolonged at the summit into tonguelike auricles. Stems often of very unequal lengths, mostly 2–4 dm tall. Principal inflorescence bract often, though not always, exceeding the cyme. Cymes with 2-several ascending branches, mostly to ca. 6–8 cm high. Flowers and fruits borne singly on the axes. Perianth segments subequal, equalling or usually exceeding the capsule, lance-subulate. Capsule plump, the angles slightly ridged, straw-colored, ovoid-oblong, the summit rounded. Seeds dark amber, irregular, asymmetrical, very finely reticulate, the alveolae long and narrow transversely.

Moist to wet sites, shores, swamps, commonly weedy in compacted soil of roadways, paths, etc. Semicosmopolitan in North America, naturalized elsewhere.

8. Juncus dichotomus Ell. Fig. 320

Perennial, cespitose. Leaf sheaths bearing long, subterete, grooved blades; sheaths with thick-hyaline margins, the summits with short, rounded, firm cartilaginous auricles. Stems to about 8 dm tall. Cyme loose to compact, 2–8 cm high, the branches few to numerous. Flowers and fruits borne singly on the axes. Perianth segments lance-attenuate, the outer longer than the inner, the inner about equalling the capsule, the outer exceeding it. Capsule plump, the angles slightly ridged, about 4 mm long, ovoid-oblong to obovoid, the summit rounded then abruptly short-beaked, straw-colored to reddish brown, lustrous. Seeds irregular in size and shape, mostly variously asymmetrical, reticulate, the alveolae nearly isodiametric, amber brown.

Moist to wet sands, usually in open areas, marshy shores, clearings, sometimes in wet lowland forests. Mass. to cen. pen. Fla., w. to Okla. and Tex.

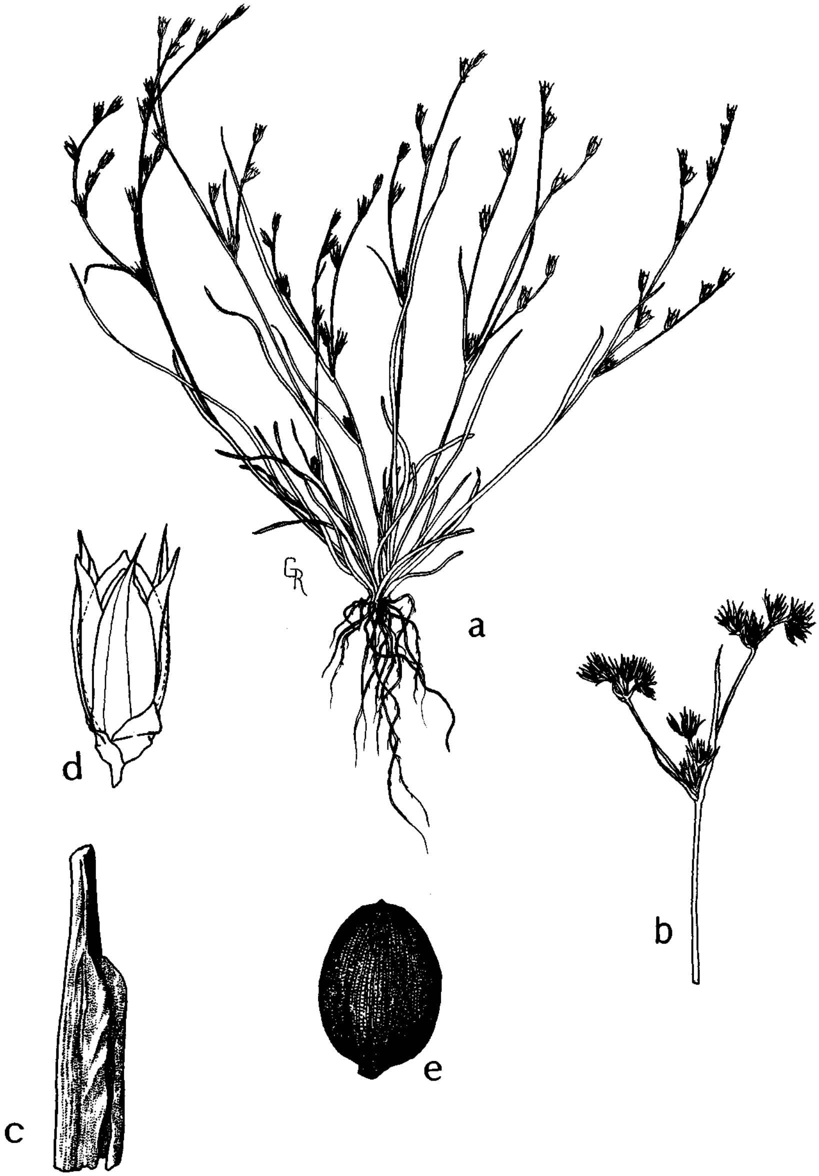


Fig. 318. **Juncus bufonius:** a, habit; b, inflorescence of variant; c, leaf sheath; d, perianth and capsule; e, seed.

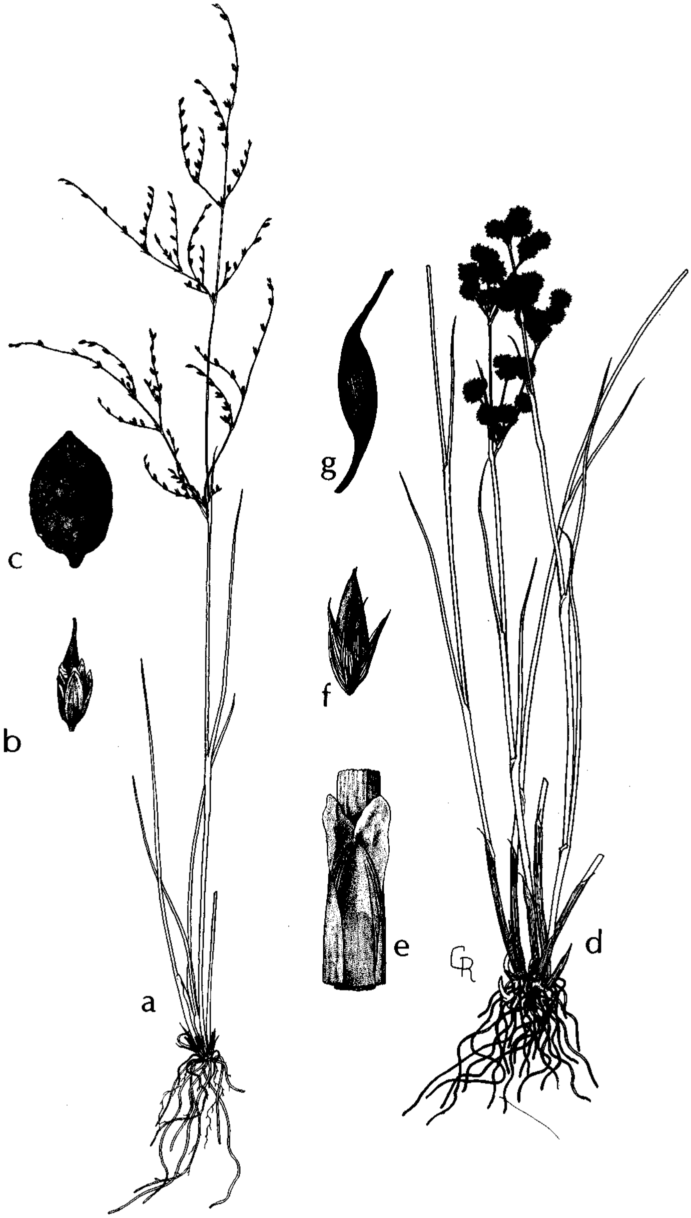


Fig. 319. a–c, **Juncus abortivus:** a, habit; b, perianth and capsule; c, seed; d–g, **Juncus canadensis:** d, habit; e, leaf sheath; f, perianth and capsule; g, seed.

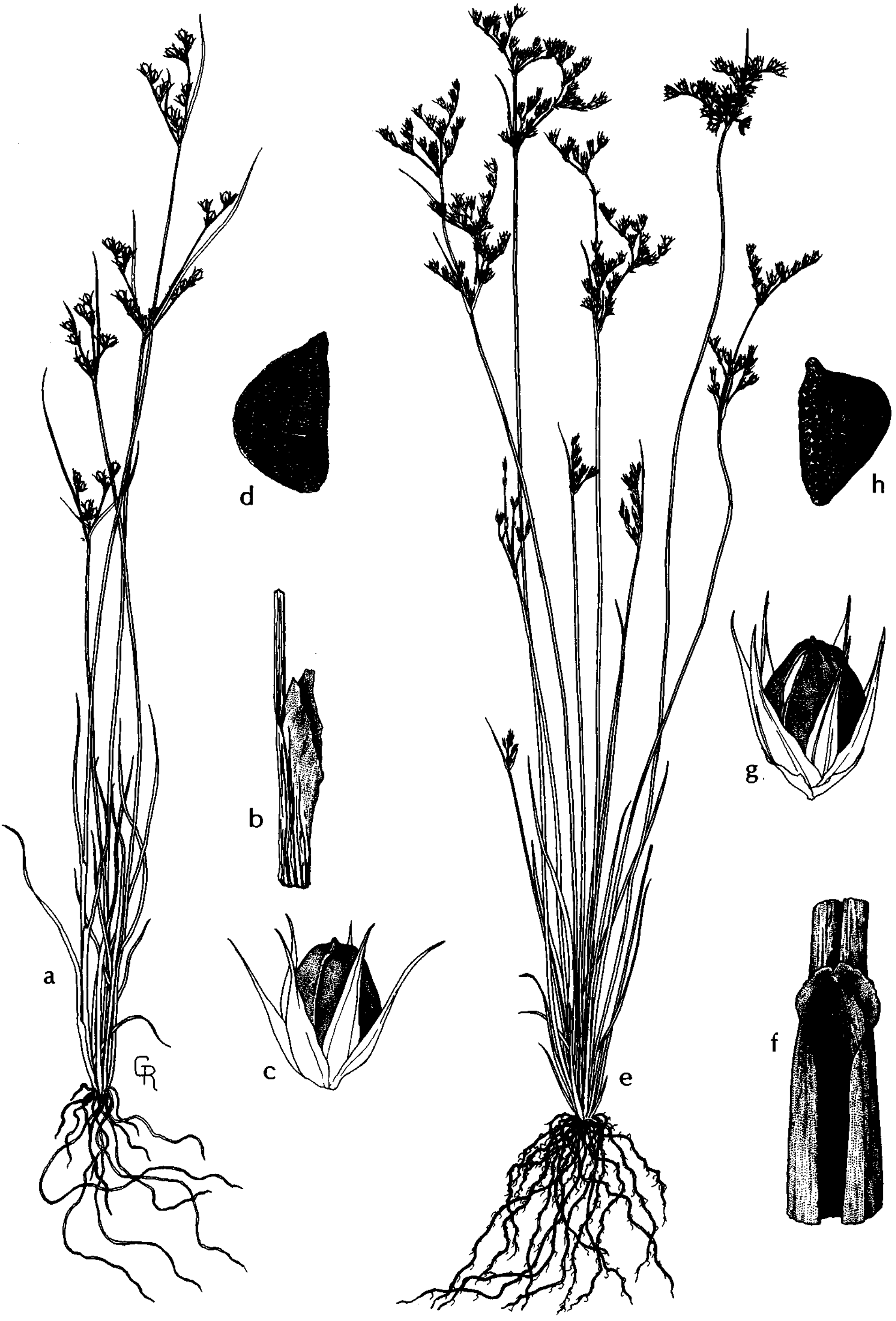


Fig. 320. a–d, **Juncus tenuis:** a, habit; b, sheath; c, perianth and capsule; d, seed; e–h, **Juncus dichotomus:** e, habit; f, sheath; g, perianth and capsule; h, seed.

9. Juncus capitatus Weigel. Fig. 321

Annual, in small tufts. Stems filiform, 3–10 cm tall. Leaves very narrow, flat, linear-subulate, about half as high as the stems. Flowers and fruits usually 2–several in a single capitate cluster, or in 2–3 clusters more rarely. Outer perianth parts about 3 mm long, ovate, their apices acuminate-aristate, markedly keeled, quite enclosing the much smaller, lanceolate, membranous inner ones and the capsule. Capsule obscurely trigonous, chestnut brown and somewhat suffused with purplish pigment, the summit abruptly narrowed to a mucro. Seeds amber, oblong or elliptical, often asymmetrical, very finely reticulate.

Native in the Old World, presumably a recent introduction. Moist to wet sands. La., Tex.; Calif.

10. Juncus repens Michx. Fig. 322

Perennial; in soft, short tufts when terrestrial; in shallow water perennating by creeping and rooting at the nodes, usually not bearing flowering stems unless or until the water recedes; in deeper water, the internodes long and lax, proliferating at the nodes, eventually dropping and rooting at the nodes; in either of the latter cases forming extensive matted clones, remaining sterile and overwintering if submersed or producing flowering stems if emersed. Leaf sheaths short, merely folded, the blades flat, soft, linear-attenuate, subopposite or subfascicled at the proliferating nodes. Flowering and fruiting stems with a single cluster at the summit, a few cymose clusters on unequal branches, or proliferate-branched from near the base. Perianth segments lance-subulate, the inner considerably longer than the outer and exceeding the capsules. Capsule brown, slender, lance-triangular, the summit blunt, about 4 mm long. Seeds dark brown, dull, asymmetrical, more or less oval, very finely lined-reticulate.

Ponds, lakes, borrow pits, flatwoods depressions, cypress-gum ponds, ditches and drainage canals. Del. to s. Fla. w. to Tex., northward in the interior to Okla. and Tenn.

11. Juncus filipendulus Buckl. Fig. 323

Tufted perennial, often with hard somewhat swollen bases. Stems to about 3.5 dm tall. Lower leaves little exceeding half the height of the flowering stems; blades flat, soft and flexuous, 1–2.5 mm wide. Flowers and fruits in spherical or hemispherical straw-colored glomerules, 5–8 mm across, these sometimes solitary, or 2–5 (–10) in a little branched inflorescence. Flowers few per glomerule, usually 6–15, sometimes fewer. Perianth segments nearly equal, straw-colored at maturity, much exceeding the capsule, ovate, the apices narrowed to sharp tips. Capsule obovate, truncate at the summit, brown. Seeds elliptical, amber, surficially striate.

Moist to wet calcareous soils, or in shallow water of streams in limestone areas. Tenn., Ala. to Okla. and Tex.

12. Juncus marginatus Rostk. Fig. 324

Perennial with short knotty rhizomes, often forming clumps. Stems somewhat flattened, to 12 dm tall. Leaf blades flat, 3–5 mm wide, the uppermost blade usually shorter than its sheath or sometimes bladeless. Cymes varying from very compacted to much branched, relatively open and more or less obpyramidal, 2–15 cm high. Flowers and fruits borne in several to ca. 200 clusters of 2–several in each cluster. Outer perianth segments shorter than the inner, the latter about equalling the capsules in length; outer somewhat keeled, acute and ending in a mucro, the inner much broader, with broader hyaline margins toward the obtuse or rounded apices. Capsules plump, terete, broadly elliptic to obovoid, the summits rounded, 2–2.5 mm long, reddish brown and lustrous. Seeds (even in a single capsule) irregular in size, shape and surface markings: symmetrical to very asymmetrical, oblong-truncate to short-caudate, the surfaces from evenly, finely reticulate to longitudinally dark-ridged or dark-lined reticulate; pale to dark amber. (*J. aristulatus* Michx.; *J. biflorus* Ell.)

Moist to wet sands and peats, generally in open areas, bogs, shores, marshes,

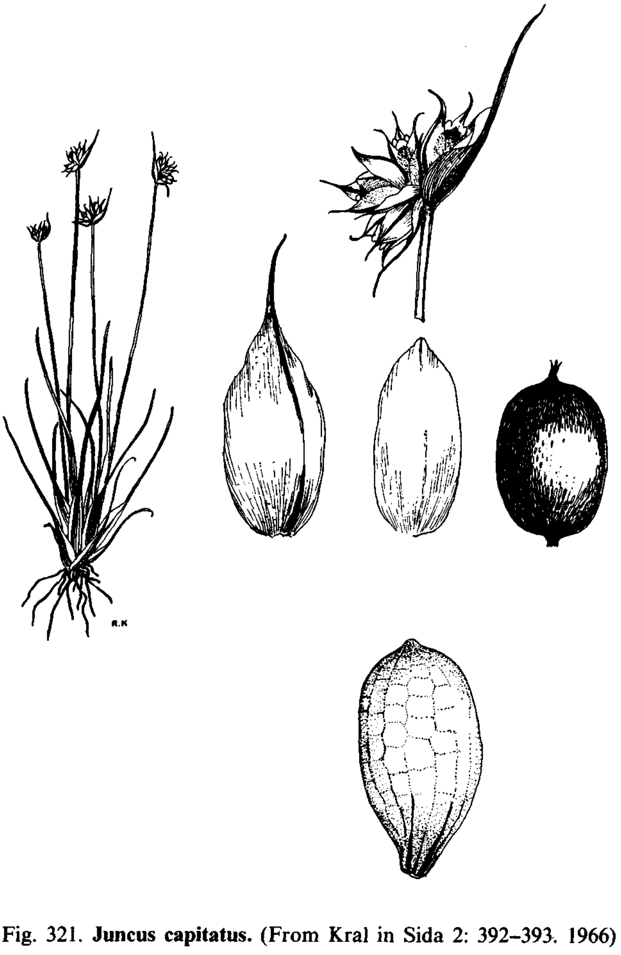


Fig. 321. **Juncus capitatus.** (From Kral in Sida 2: 392–393. 1966)

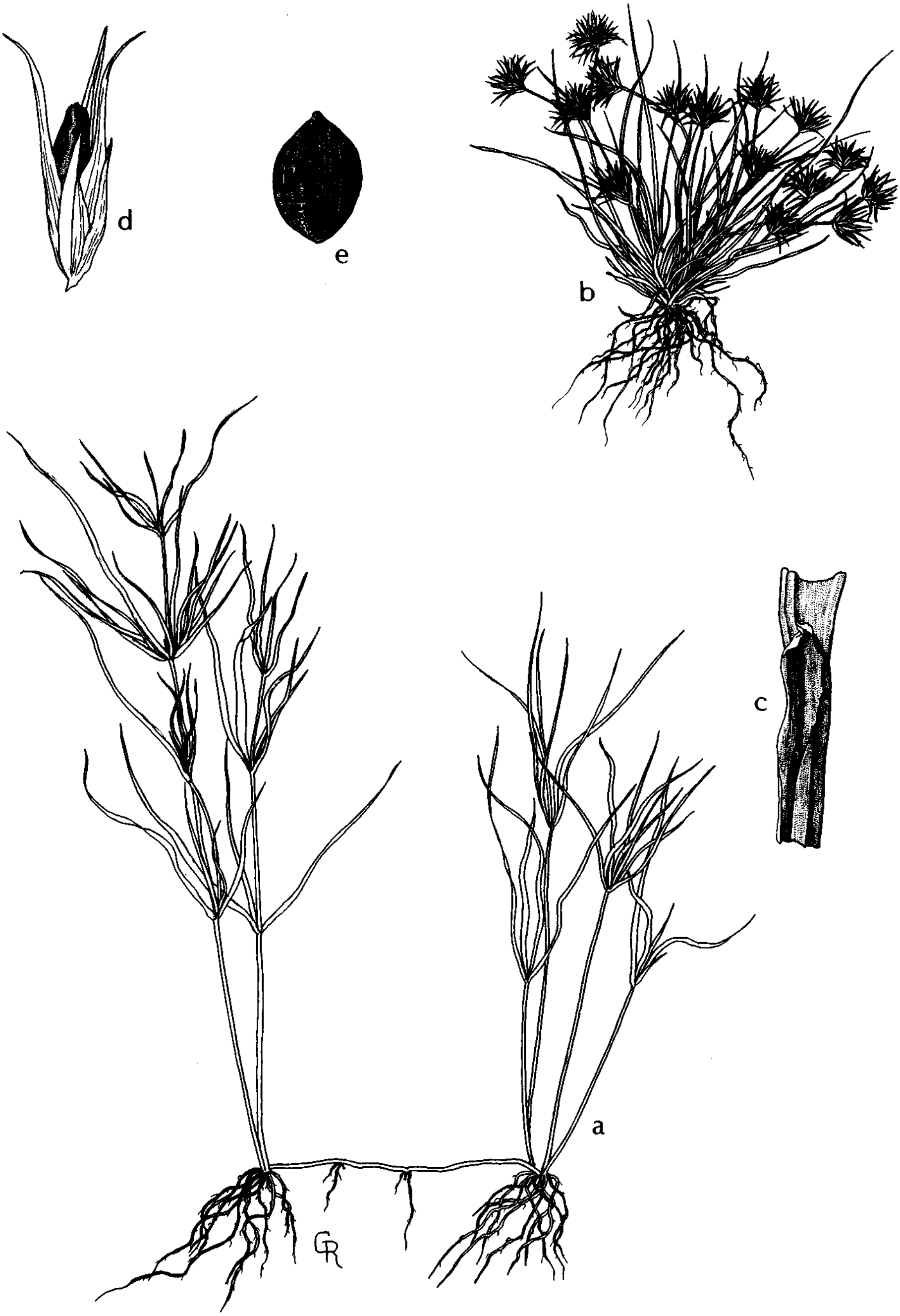


Fig. 322. **Juncus repens:** a, sterile submersed plant, habit; b, flowering emersed plant, habit; c, leaf sheath; d, perianth and capsule; e, seed.

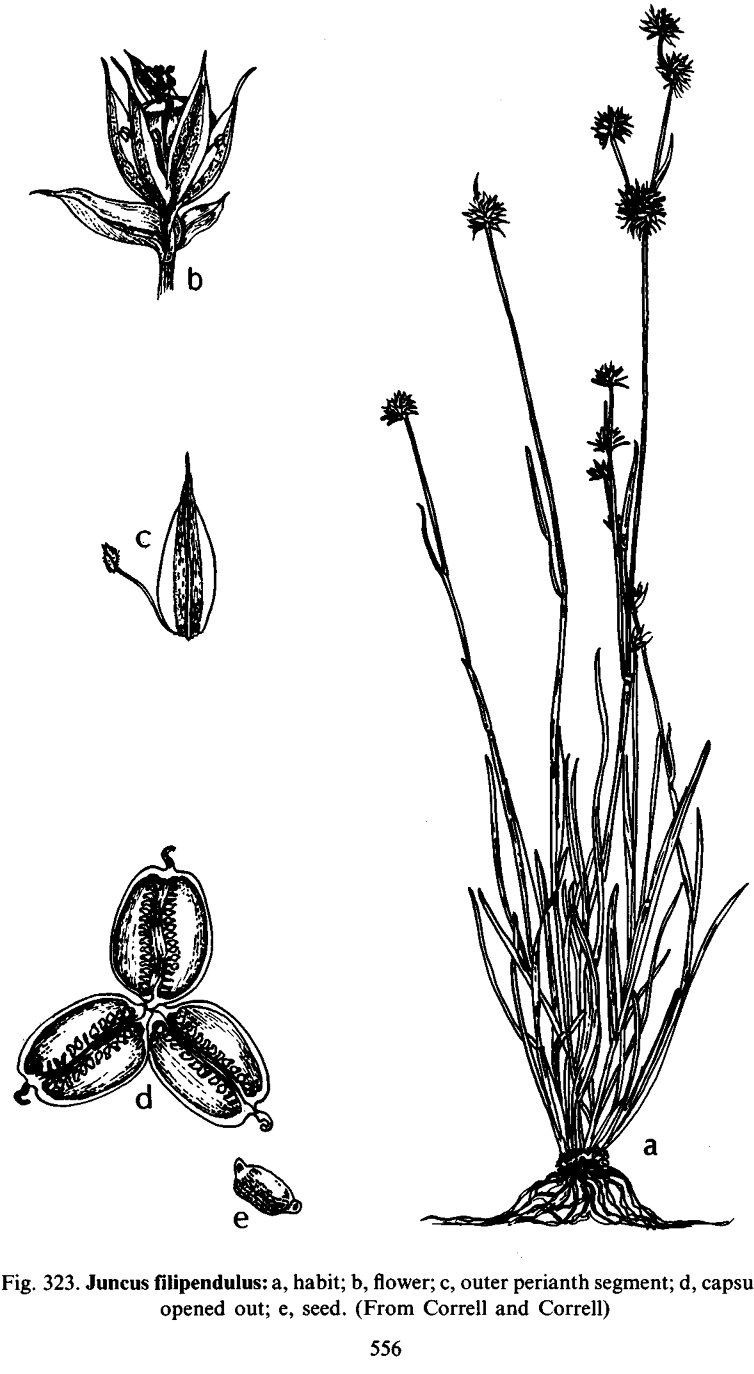


Fig. 323. **Juncus filipendulus:** a, habit; b, flower; c, outer perianth segment; d, capsule opened out; e, seed. (From Correll and Correll)

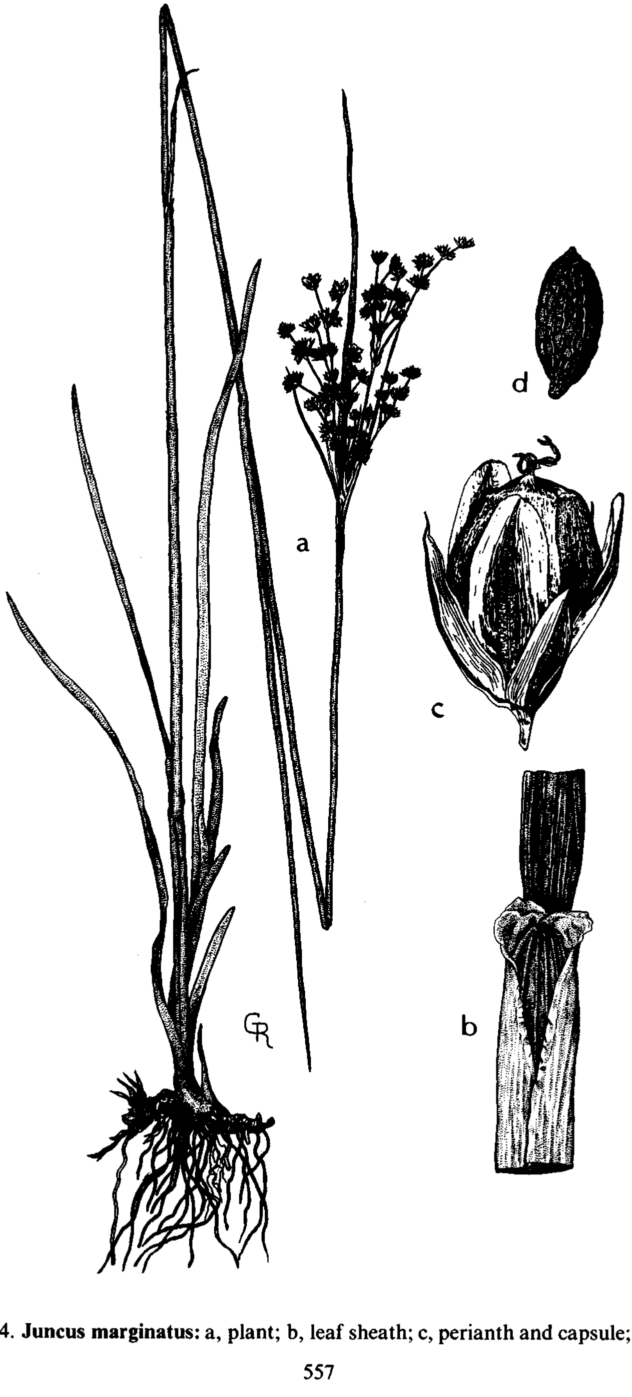


Fig. 324. **Juncus marginatus**: a, plant; b, leaf sheath; c, perianth and capsule; d, seed.

commonly abundantly colonizing wet clearings and roadsides. N.S. to Mich. and S.Dak., generally southward to s. Fla. and Tex.; Ariz.

Juncus longii Fern. appears to us to be a stoloniferous form of *J. marginatus.*

13. Juncus trigonocarpus Steud. Fig. 325

Perennial, often in large clumps, with relatively coarse, tough and rigid stems to nearly 1 m tall. Lower leaves bladeless sheaths, those above with terete blades, their tips stiff-pointed; with cross partitions which are not especially evident from the exterior. Inflorescence terminal, usually with 2–3 principal rigid, roughly obpyramidal cymes one above the other, the branches of these bearing numerous turbinate clusters of 2–4, rarely more, flowers. Perianth segments lanceolate, the tips acute, stiff and hard, much shorter than the capsule, the inner slightly longer than the outer, at maturity often somewhat suffused with purplish pigment. Capsule hard, trigonous, lanceolate, gradually tapered to a sharp point, at maturity lustrous, deep purplish red or a rich mahogany color. Seed body light brown, a long whitish tail on either end formed by the enveloping membrane.

Sphagnous bogs, seepage slopes, sometimes in muck of streams, especially those draining titi swamps or bogs. Coastal plain, N.C. to Fla. Panhandle, w. to e. Tex.

13a. Juncus brachycephalus (Engelm.) Buch.

Perennial, cespitose, with relatively slender stems to about 7 dm tall. Leaves with terete blades, the cross partitions of which are not usually evident exteriorly except at the tips. Inflorescence terminal, more or less obpyramidal in outline, usually with several cymes one above the other and relatively diffuse, their branches bearing turbinate clusters of 2–5 flowers. Perianth segments lance-oblong, greenish centrally and with conspicuous hyaline margins, bluntish apically, the outer somewhat shorter than the inner. Capsule 3-angled, much exceeding the perianth, abruptly contracted apically to a short beak, brown. Seed body light brown, a whitish tail at either end, 0.8–1.2 mm long, the body constituting about ⅗ of the length.

Seepage areas, gravelly or sandy shores, wet meadows. Maine to n. Ont. and Minn., s. to Pa., Ohio, Ind., Ill., Tenn. and n.w. Ga.

14. Juncus canadensis J. Gay ex Laharpe. Fig. 319

Perennial, vegetatively much as in the preceding. Inflorescence with glomerules in compact to loosely spreading cymes, the number of glomerules very variable, from about 5–50. Glomerules turbinate to hemispherical or spherical, few–many-flowered. Perianth segments lance-subulate, green or straw-colored at maturity, the inner slightly longer than the outer. Capsule somewhat exserted from the perianth or about equalling it, trigonous, straw-colored, usually abruptly contracted at the summit, sometimes with a short taper. Seeds slenderly fusiform, 1.2–2 mm long, the slender whitish tails constituting more than half the length.

Swamps, marshes, marshy shores, bogs, flatwoods depressions, wet meadows. Que. and N.S. locally to Minn., s. to Ill. and Ind.; southward in the Atlantic States to cen. pen. Fla.

15. Juncus brachycarpus Engelm.

Rhizomatous perennial. Stems to about 8 dm tall. Leaf blades terete, with cross partitions not especially evident from the exterior. Inflorescence a crowded to open, few-branched cyme of 2–10 many-flowered, spherical, green to dull brown glomerules 7–10 mm across. Perianth segments green to straw-colored, lance-subulate, the outer longer than the inner, much exceeding the capsule. Capsule trigonous, obovate, golden brown, abruptly contracted into an apiculation, one-half to two-thirds as long as the perianth. Seeds obliquely oblong to elliptic, about 0.5 mm long, amber, surficially obscurely reticulate.

Moist to wet open sands, clays or peats, commonly colonizing ditches. Mass. to Ga., w. to Tex.; in the interior to s. Ont.

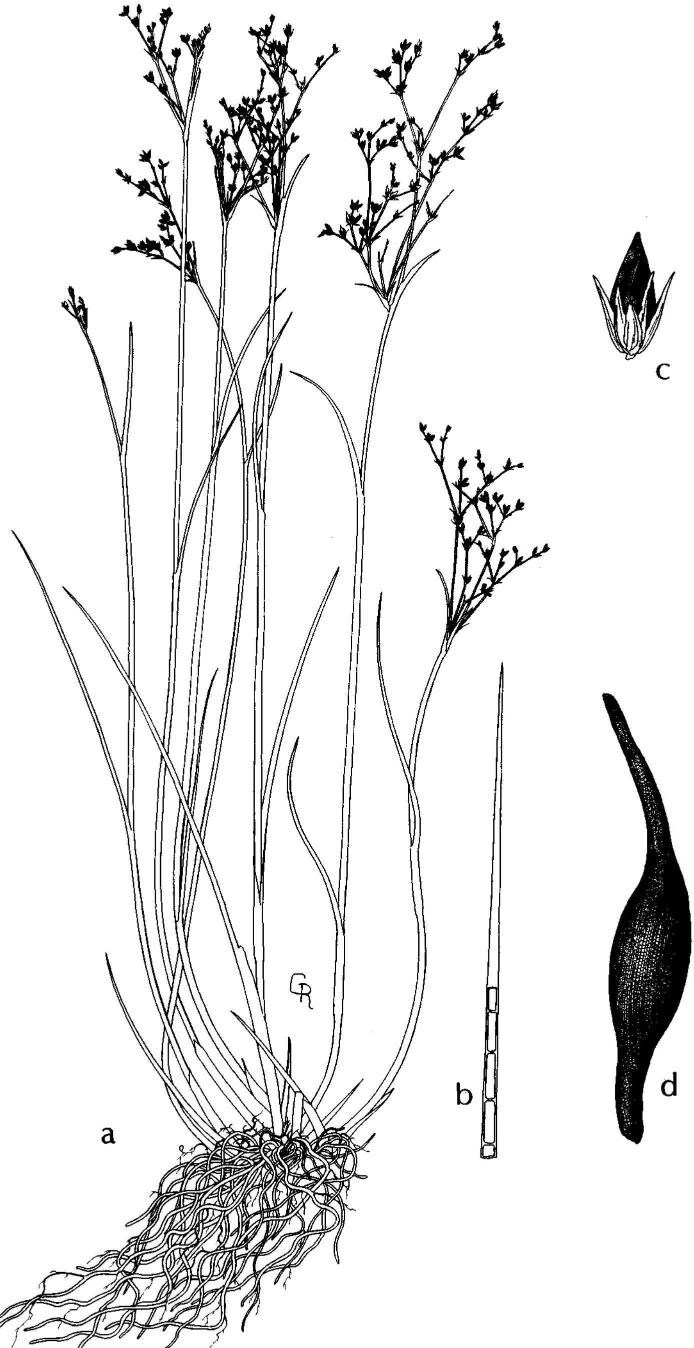


Fig. 325. **Juncus trigonocarpus:** a, habit; b, portion of leaf sectioned to show septae; c, perianth and capsule; d, seed.

16. Juncus debilis Gray. Fig. 326

Tufted perennial with soft bases. Stem slender and weak, mostly 1.5–3.0 dm tall. Leaf sheaths loose, usually suffused with reddish-purplish pigment, the margins white, hyaline, at the summit with 2 tonguelike membranous auricles; blades very slender, to 1 mm across, the cross partitions inconspicuous. Cymes usually several times branched, occasionally diffusely branched. Glomerules few-flowered (2–10), turbinate to hemispherical. Perianth segments about equal, lanceolate-acute, soft, shorter than the capsule, usually more or less suffused with purplish pigment. Capsule lanceolate, trigonous, mucronate at the summit, 2.3–3.0 mm long, one-third longer than the perianth. Seeds oblong-elliptic, amber, surficially reticulate.

Marshy shores, in small streams, swamps, wet clearings, spring runs, commonly in very soft mucky substrate. R.I. to Mo., generally southward to n. Fla. and e. Tex.

17. Juncus diffusissimus Buckl. Fig. 326

Similar to the preceding (perhaps not specifically distinct), usually with a more diffuse inflorescence; glomerules with a contrastingly different aspect because of the much longer exsertion of the capsules from the perianths. Capsules mostly twice as long as the perianth or a little longer, 4–5 mm long, tending to have a more gradual taper upwardly than in *J. debilis.*

In soft mucky substrates, marshy shores, sloughs, occasionally in wet wooded places, often in shallow water; commonly abundantly colonizing wet sandy alluvial outwash in ditches and clearings. Chiefly coastal plain from s.e. Va. to n. Fla. thence to e. and n. cen. Tex.; s. Ind. to Mo., Kans., and Okla, Tenn. and Ky.

18. Juncus nodatus Coville.

Perennial with hard knotty bases, clump-forming. Stems 6–12 dm tall. Basal leaves bladeless loose sheaths whose summits are free, long-tapering, sometimes abruptly aristate at their summits; blades of stem leaves terete, prominently nodose-septate. Cymes much branched, to about 2 dm long, the ultimate glomerules very numerous, often to 200 or more, mostly turbinate, 2–10-flowered. Perianth segments nearly equal, lance-subulate, brown at maturity except for their straw-colored scarious margins. Capsule oblong-ovate, brown, the summit rounded to truncate except for an apiculation on some, slightly exceeding the perianth. Seeds elliptic, amber, faintly reticulate. (*J. robustus* (Engelm.) Coville not S. Wats.)

Commonly in shallow water, marshy shores, sloughs, wet flatwoods and savannas, bogs, ditches. Ind. to Kans., southward to Ala., Miss., La., and much of Tex.

19. Juncus elliottii Coville. Fig. 327

In general very much like the preceding though the stems and leaves less stout, the stems on the average not so tall, about 5 dm, though some are to 9 dm. Careful extraction of the roots from the substrate almost always reveals some roots tuberous-thickened at their extremities. The leaf blades are notably more slender, 1–2 mm across near the middle (as opposed to 2.5 mm across in *J. nodatus*) and the cross partitions are much less evidently marked exteriorly. Note that although the ranges overlap, they are for the most part different and the habitat appears to be different.

Wet sands, peaty sands, or peat, exposed shores of ponds and lakes, depressions in savannas and flatwoods, commonly very abundantly colonizing moist to wet much disturbed clearings, roadsides and ditches. Coastal plain, Del. to cen. pen. Fla., w. to s.e. Tex.

20. Juncus acuminatus Michx. Fig. 327

Perennial with hard bases and clump-forming. Stems (3–) 6–8 dm tall. Leaf blades terete, the positions of the cross-partitions not usually conspicuously evident exteriorly. Cymes variable, few–many-branched, the ultimate glomerules mostly hemispherical, sometimes turbinate or spherical, (2–)5–10(–15)-flowered. Perianth segments lance-

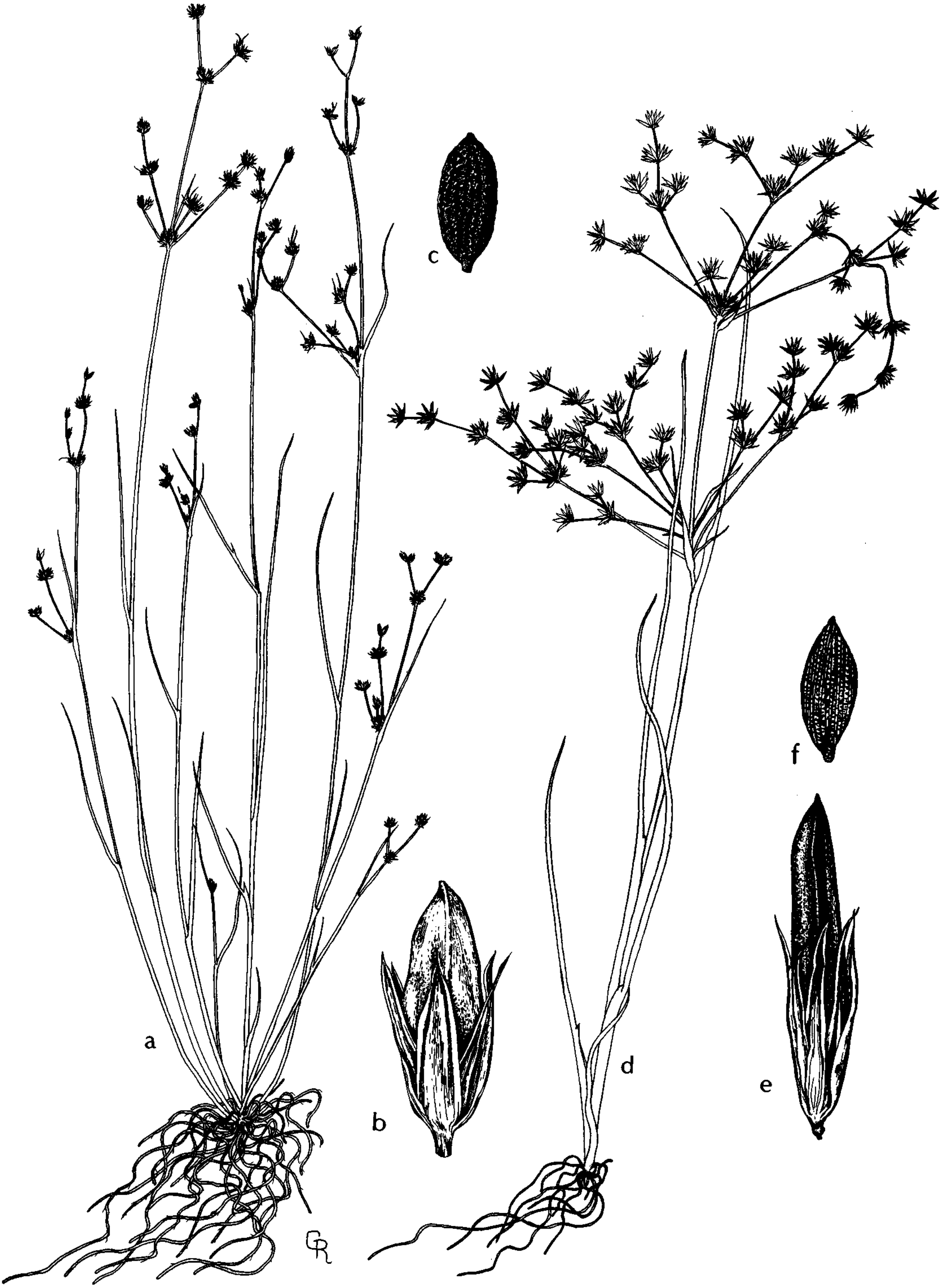


Fig. 326. a–c, **Juncus debilis:** a, habit; b, perianth and capsule; c, seed; d–f, **Juncus diffusissimus:** d, habit; e, perianth and capsule; f, seed.

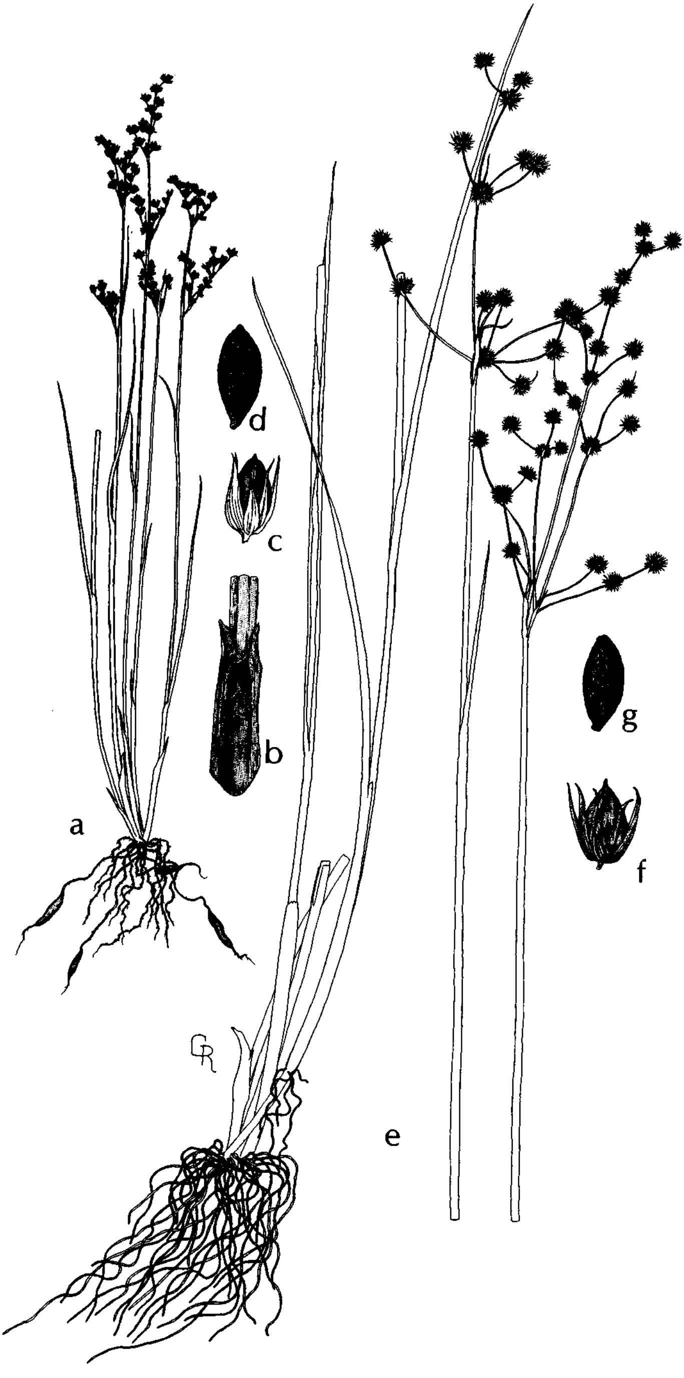


Fig. 327. a–d, **Juncus elliottii:** a, habit; b, leaf sheath; c, perianth and capsule; d, seed; e–g, **Juncus acuminatus:** e, habit; f, perianth and capsule; g, seed.

subulate, nearly equal in length and equalling the capsule, the outer strongly boatlike, the apices long-stiff-pointed; straw-colored to light brown or reddish brown at maturity. Capsule ovoid, trigonous, abruptly narrowed above to a mucro, brown or chestnut brown. Seeds oblong-elliptic, lined-reticulate, dark amber.

Marshy shores of ponds, lakes, streams, wet meadows, borders of cypress-gum depressions, springy places. Maine and N.S. to Ont. and Minn., generally southward to n. Fla., Tex. and n. Mex; B.C. to Calif.

21. **Juncus polycephalus** Michx. Fig. 328

Robust perennial, subrhizomatous and often forming broad clumps. Stems to 1 m tall, coarse, to 1 cm across basally. Basal sheaths, purplish, broad and loose, passing imperceptibly into short or long blades; blades laterally compressed, 4–8 mm across medially, soft, usually with incomplete septae, usually arcuate. Cymes 1–3 dm high, usually with long divergent or ascending secondary branches, the ultimate glomerules few–many, to 1 cm across, spherical, many-flowered, at maturity with a decided red-brown or brown cast. Perianth segments equal, linear-setaceous, their long points stiff, exceeded by the narrow beak of the capsule. Capsule chestnut brown, subulate, dehiscing below but the valve tips remaining united and the tip exserted from the perianth. Seeds lance-elliptic, dark amber, reticulate.

In wet or seasonally wet places, marshy shores, borders of small streams, ocasionally in fairly deep water of streams, pineland or savanna depressions, cypress-gum ponds, usually with a peaty or mucky substrate. Commonly abundantly colonizing wet peaty ditches. Coastal plain, N.C. to s. Fla., w. to s.e. Tex.; Tenn.

J. polycephalus and *J. megacephalus* not infrequently grow in close proximity or even intermixed. Certain specimens (from Florida) in the series we have examined appear to combine features of each so that we suspect that they occasionally hybridize.

22. **Juncus validus** Coville. Fig. 329

Similar to the preceding in general aspect, usually not as coarse or stout, the stems 3–5 mm across basally; the sheaths green rather than purplish, the blades somewhat narrower, 3–6 mm across medially and with complete septae. Inflorescence similarly branched, the glomerules usually perceptibly larger, (10–) 12–15 mm across, at maturity greenish to light brown. Capsules straw-colored, the valves not adhering after dehiscence but widely spreading. Seeds very broadly elliptic rather than lance-elliptic.

Moist to wet open sites, usually sandy, sometimes peaty, exposed or marshy shores of ponds, lakes and streams, ditches, fields. N.C. to n. Fla., w. to Tex., Okla. and Mo.

23. **Juncus torreyi** Coville.

Plant perennating by slender rhizomes bearing tuberous thickenings. Stems to 10 dm tall. Leaves slenderly long-tapering, terete, with cross partitions not very evident, if at all, exteriorly; uppermost stem leaf (not the bract of the inflorescence) with a blade very much longer than its sheath, reaching the inflorescence or overtopping it. Inflorescence usually of few spherical, dull brown, many-flowered glomerules 1–1.5 cm across, its subtending bract exceeding it. Perianth segments lance-setaceous, the tips hard and rigid, the outer segments longer than the inner. Capsule subulate, trigonous, usually the sharp-pointed tip exceeding the perianth, fully dehiscent. Seeds amber, elliptical, very finely lined-reticulate.

Open moist to wet sites, on chalk in some areas, commonly colonizing ditches. Mass. to Sask., s. to Ala. and Tex., w. to Calif., n. Mex.

24. **Juncus megacephalus** M.A. Curtis. Fig. 330

Perennial with hard knotty bases, perennating by basal offshoots, clump-forming. Stems to 10 dm tall or slightly more. Lower leaf sheaths bladeless, usually purplish, loose; stem leaves with terete blades, the cross partitions not very, if at all, evident exteriorly; uppermost stem leaf (not the bract of the inflorescence) sometimes a bladeless sheath; otherwise with a blade no longer than its sheath, usually shorter, without cross parti-

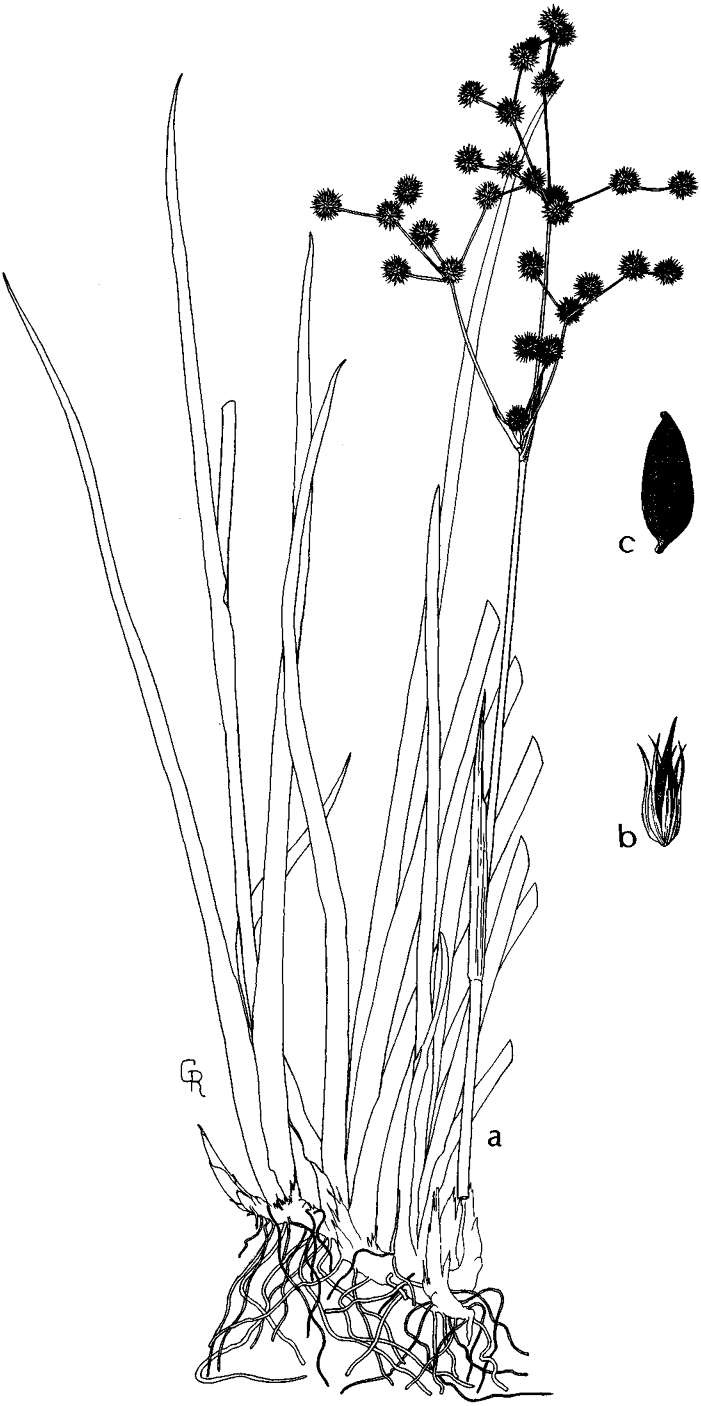


Fig. 328. **Juncus polycephalus:** a, habit; b, perianth and capsule; c, seed.

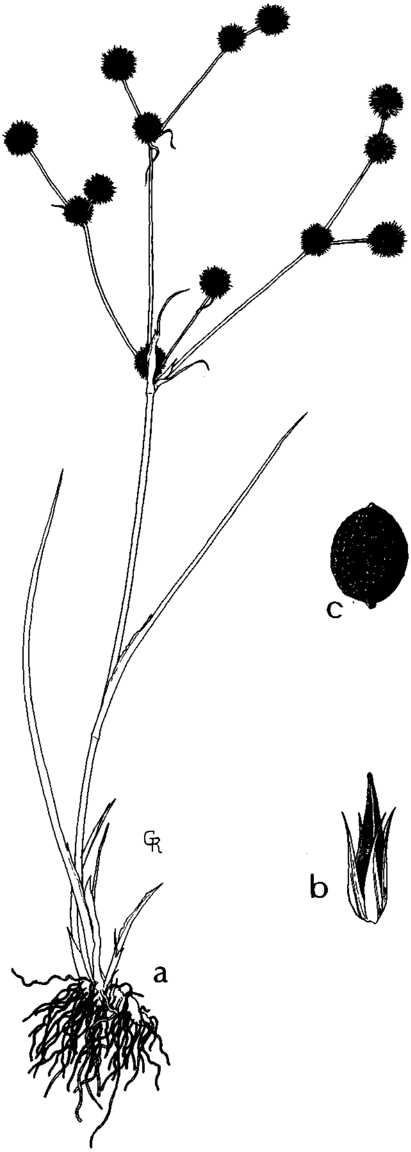


Fig. 329. **Juncus validus:** a, habit; b, perianth and capsule; c, seed.

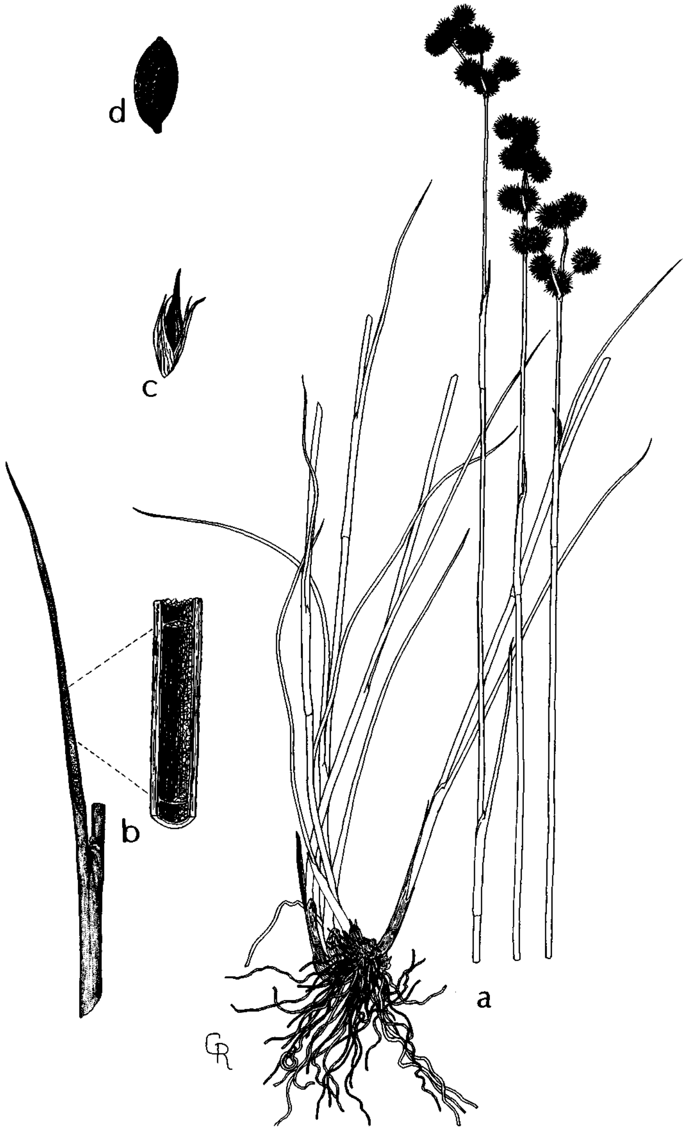


Fig. 330. **Juncus megacephalus:** a, habit; b, sheath and leaf sectioned to show septae; c, perianth and capsule; d, seed.

tions, and not nearly reaching the inflorescence. Cymes of few to numerous usually reddish brown or purplish red, many-flowered, spherical heads 5–12 mm across; bract subtending the inflorescence short and inconspicuous. Perianth segments linear- or lance-setaceous, the tips stiffish and at maturity usually purplish red, the outer segments somewhat exceeding the inner. Capsule lance-subulate, golden brown except the usually purplish tip, barely if at all exceeding the perianth. Seeds elliptical, dark amber, surficially vaguely lined-reticulate.

In moist or wet usually open places, often in shallow water, in sands, peats and marls; marshy shores, interdune hollows, swales, brackish and fresh marshes, marl prairies, bogs, often abundantly colonizing ditches. Coastal plain, Va. to s. Fla., w. to s.e. Tex.

25. Juncus scirpoides Lam. Fig. 331

Similar in many respects to the preceding. Although clump-forming, unlike *J. megacephalus,* it has stoutish, pale rhizomes. The blade of the uppermost stem leaf in this species is generally considerably longer than its sheath and is commonly conspicuously nodose-septate viewed exteriorly; it does not reach or exceed the inflorescence as in *J. torreyi.* The inflorescence glomerules may be spherical but are very commonly lobed (i.e., with subglomerules); they are, at maturity, dull brown rather than reddish, the subulate tips of the capsules conspicuously exceeding the perianths when fully mature (but not in immature stage).

Wet sands or peaty sands, muds, marls, sometimes in shallow water; flatwoods or savanna depressions, bogs, marshy shores, exposed pond margins, wet prairies. S. N.Y. to s. Fla., mostly coastal plain and piedmont; w. to Tex.; Ind. to Mich., Mo. and Okla.

2. Luzula (WOOD RUSHES)

Perennial grasslike herbs of low stature, usually tufted, the leaves basally with closed sheaths encircling the stem, the blades flat, or involute terminally, soft, more or less pubescent. Inflorescence cymose-umbellate, the rays of the umbel bearing solitary flowers (rarely pairs), or glomerules. Flowers bisexual. Perianth of 6 chafflike or scalelike, essentially similar parts in 2 series. Stamens 6. Fruit a 1-locular loculicidal capsule bearing 3 plump ellipsoid seeds.

It is with some misgivings that we choose to include wood rushes in a treatment of wetland plants because, in general, they tend to inhabit well-drained woodlands. However, they do inhabit moist to wet banks of woodland streams, bottomland woodlands, meadows, seepage banks, moist roadsides.

1. Flowers solitary at the ends of the rays of the umbel, or if the ray is branched, one at the point of the branch and one at the end of the branch (rarely in pairs). 1. *L. acuminata*
1. Flowers in glomerules, terminally on the rays or terminally and in the forks if branched.
  2. Plants without whitish bulblets just below the substrate; rays of the umbel filiform-flexuous, at maturity some of them wide-spreading or reflexed; perianth segments equalling or exceeding the capsule. 2. *L. echinata*
  2. Plants with several-numerous whitish bulblets just below the substrate; rays of the umbel stiffish, erect or erect-ascending (rarely spreading or reflexed); perianth segments somewhat shorter than the capsule. 3. *L. bulbosa*

1. Luzula acuminata Raf. Fig. 332

Plant loosely cespitose, sometimes with scaly stolons to about 6 dm long, or sometimes short-rhizomatous. Stems 1–4 dm tall. Leaf blades lance-linear to elliptic-linear, variously pilose on their margins, with a nearly terete callused tip; basal leaves variable in length, up to about 3 dm, commonly much shorter, to 10 mm wide at their widest places. Inflorescences 3–6 cm high; rays almost filiform, loosely spreading, with a single terminal flower, or some with a lateral flower, or some cymosely branched and bearing 3–4 flowers. Perianth segments nearly equal, ovate or lance-ovate, apically acuminate,

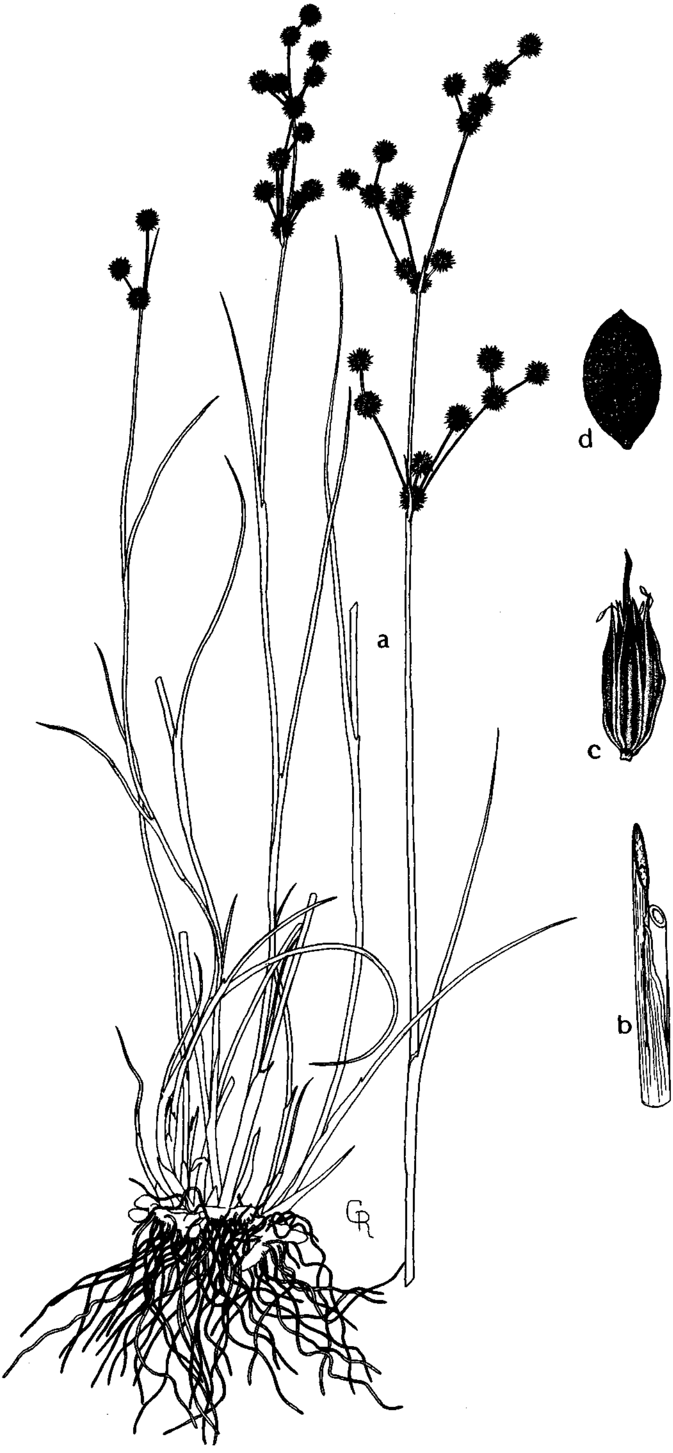


Fig. 331. **Juncus scirpoides:** a, habit; b, leaf sheath; c, perianth and capsule; d, seed.

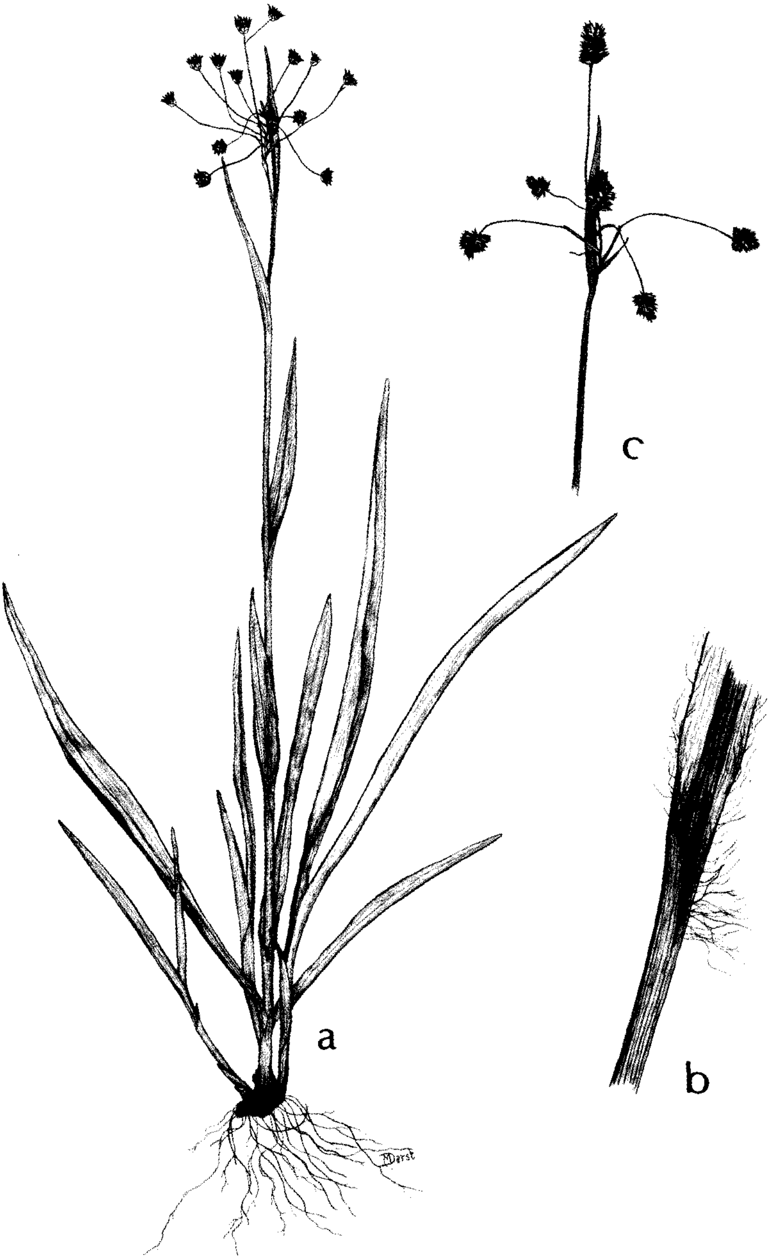


Fig. 332. a–b, **Luzula acuminata:** a, habit; b, portion of leaf at junction of sheath and blade; c, **Luzula echinata:** inflorescence.

light brown to brown or chestnut brown medially, the margins scarious, 2.4–4.5 mm long, about equalling the capsule or somewhat shorter than the capsule. Capsule ovoid, apiculate, mostly pale green. Seeds about as broad as long, 1 mm or a little more, with a pale terminal caruncular appendage about as long.

Plants whose umbels are simple may be referred to *L. acuminata* var. *acuminata* (*Juncoides saltuense* (Fern.) Small); those whose umbels are branched and bearing 3–4 flowers may be referred to *L. acuminata* var. *carolinae* (Wats.) Fern. (*Juncoides carolinae* (Wats.) Kuntze.)

Various well-drained woodlands, clearings, banks of woodland streams, bottomland woods. Nfld. to Sask., generally southward to Fla. Panhandle and La.

2. Luzula echinata (Small) Hermann. Fig. 332

Plants loosely cespitose, sometimes knotty rhizomatous basally. Stems 1–4 (–5) dm tall. Leaf blades linear to lance-linear, margins more or less pilose, the tip nearly terete, callused; basal leaves variable in length, to about 15 cm long, 2–7 mm wide. Rays of the inflorescence filiform-flexuous, at maturity some of them horizontally divergent to reflexed, the flowers in ovate to subglobose glomerules terminal on the rays or terminal and in the forks if branched. Perianth segments 3–4 mm long, as long as the capsule or a little longer, ovate or ovate-lanceolate, mostly acuminate apically, the inner sometimes acute or obtuse, the outer usually keeled, the inner flattish, pale brown to chestnut brown medially, scarious on the margins. Capsule obovoid, short-apiculate, pale yellow-brown to brown. Seeds ellipsoid, dark brown, 1 mm long or a little more, with a pale yellowish caruncular appendage about ½ as long. (*Juncoides echinata* Small)

Dry to moist woodlands, banks of woodland streams, bottomland woods, thickets and clearings. S.e. Mass., s.e. N.Y., N.J., Pa. to s. Ill., s. to Fla. Panhandle and e. Tex.

3. Luzula bulbosa (Wood) Rydb.

Similar to the preceding, differing as follows: just below the substrate producing several–numerous ovate-acuminate, whitish bulblets; rays of the inflorescence stiffish, all erect or erect-ascending (rarely spreading or reflexed), the glomerules sometimes ovate but usually cylindric; perianth segments usually a little shorter than the broadly obovoid, dark brown capsules. (*Juncoides bulbosa* (Wood) Small)

This and *L. echinata* (and several other taxa) interpreted by some authors as varieties of *L. campestris* (L.) DC. which, if broadly conceived, is a highly variable complex widely distributed in temperate parts of the northern and southern hemispheres.

Woodlands, banks of woodland streams, moist grassy banks and roadsides. S.e. Mass. to Pa., w. to Ill., Mo., e. Kans., generally southward to Ga., e. and s.e. Tex.

Liliaceae (LILY FAMILY)

1. Plant viny, with tendrils terminating the stipules. 1. *Smilax*
1. Plant not viny, without tendrils.
  2. Perianth segments 5 cm long or more. 2. *Lilium*
  2. Perianth segments less than 5 cm long.
    3. Stem bearing a whorl of 5–9 leaves about midway its length, another whorl of 3 leaves at the summit. 3. *Medeola*
    3. Leaves disposed other than as described.
      4. The leaves two at about the middle of the stem (seemingly basal because half the stem is below the surface of the substrate); a single long-stalked, nodding flower above the leaves. 4. *Erythronium*
      4. Leaves and flower(s) not as above.
        5. Flowers solitary in the leaf axils. 5. *Uvularia*
        5. Flowers in terminal inflorescences.
          6. Perianth tubular, 6 small lobes at its summit. 6. *Aletris*
          6. Perianth segments separate or united only at the base.
            7. Principal leaves disposed along the stem, not close-set near the base of the stem.
              8. Perianth segments, (the inner series at least) clawed and bearing a pair of glands near the base of the blade.
                9. Axis of the inflorescence glabrous. 7. *Zigadenus*
                9. Axis of the inflorescence pubescent or roughish-scurfy. 8. *Melanthium*
              8. Perianth segments not clawed, glandless. 9. *Veratrum*
            7. Principal leaves at or near the base of the stem.
              10. Leaves 2-ranked, on opposite sides of the stem and in the same plane.
                11. Style 1; filaments woolly-pubescent. 10. *Narthecium*
                11. Styles 3, one terminating each lobe of the ovary; filaments not woolly-pubescent.
                  12. Flowers subtended by an involucre of 3 very small bracts united half way above the base or a little more. 11. *Tofieldia*
                  12. Flowers arising from a relatively large spathelike bract. 12. *Pleea*
              10. Leaves not in 2 ranks.
                13. Flowers unisexual, the staminate and pistillate on different plants. 13. *Chamaelirium*
                13. Flowers bisexual, or if unisexual then the staminate and pistillate on the same plants.
                  14. Flower stalks not subtended by bracts. 14. *Helonias*
                  14. Flower stalks subtended by bracts.
                    15. Perianth segments separate, with 1 or 2 glands near the base (glands sometimes obscured in drying). 7. *Zigadenus*
                    15. Perianth segments free or united at the base, without glands.
                      16. Perianth segments united at the base. 15. *Schoenolirion*
                      16. Perianth segments free. 16. *Amianthium*

1. Smilax (GREENBRIARS, CATBRIARS)

Woody or herbaceous vines (those of wetlands woody), climbing by tendrils which terminate stipules, the latter adnate to the leaf stalks below the tendrils. Leaves simple, alternate, netted-veined. Main stem and larger branches of most woody species variously armed with stiff or hard prickles some or most of which may disappear with age. Woody species have tough rhizomes, some wholly or partially very large and tuberous. Flowers in umbels terminating axillary stalks, small, greenish, yellowish or brownish, radially symmetrical, the perianth of six similar spreading separate parts. Flowers unisexual, the staminate and pistillate on different individual plants (dioecious); staminate flower with 6 stamens; pistillate flower with a 3-locular ovary, surmounted by a short style with 3 relatively elongate stigmatic lobes. Fruit a berry.

Shoots of the season, from rhizomes or tubers or from axillary buds of old stems, at first soft and succulent; those especially from tubers relatively stout, grow extremely rapidly and attain considerable length before branching appreciably. Such shoots bear scale leaves and tendrils, the bladed leaves eventually produced distally on the smaller branches and branchlets. Tender young shoots may be used as a vegetable.

In some woody species of *Smilax,* the leaves vary a great deal from plant to plant, or even on the same plant, and identification may be somewhat less than easily achieved. It is very helpful to have selected, adequate material, especially when one commences to learn identities.

Two of our woody greenbriars, *S. laurifolia* and *S. walteri,* are restricted to habitats having long hydroperiods, their bases much of the time in water. The others here included inhabit both well-drained and seasonally wet places.

1. Midvein on lower leaf surface much more pronounced than the principal laterals, the latter usually not evident (raised) except perhaps near the base. 1. *S. laurifolia*

1. Midvein on lower leaf surface little if any more pronounced than the principal laterals, the latter evident.

2. Lower surface of mature leaves strongly glaucous, whitish silvery or grayish; leaf blades ovate. 2. *S. glauca*

2. Lower surface of mature leaves not glaucous though usually paler green than the upper surface (if somewhat glaucous then not ovate).

3. Leaf blades prevailingly lanceolate to ovate-lanceolate, tapering apically to an acute or acuminate tip. 3. *S. smallii*

3. Leaf blades ovate, oblong, ovate-oblong, suborbicular, hastate or fiddle-shaped, apically prevailingly rounded, obtuse, or abruptly acuminate.

4. Stalks of the umbel distinctly longer than the petiole of the subtending leaf.

5. Margin of the leaf blade with a thickened cartilaginous band, this much like a prominent vein paralleling the leaf margin. 4. *S. bona-nox*

5. Margin of the leaf blades thin and flat, not banded. 5. *S. tamnoides*

4. Stalks of the umbels not exceeding the petiole of the subtending leaf.

6. Leaf blades very variable in shape: oblong, ovate, hastate or fiddle-shaped, suborbicular, at maturity usually stiff and thickish, the margin usually narrowly and tightly revolute and with a pronounced vein very very close to it, paralleling it. 6. *S. auriculata*

6. Leaf blades ovate or rarely lance-ovate, pliant, the margin thin, sometimes revolute but not with a vein immediately juxtaposed to it.

7. Mature berries bright red. 7. *S. walteri*

7. Mature berries black or blue black. 8. *S. rotundifolia*

1. **Smilax laurifolia** L. BAMBOO-VINE, BLASPHEME-VINE. Fig. 333

Plant with large, thick, heavy tuberous rhizomes, surfaces reddish and younger portions bearing large papery scales; cut sections at first fawn-colored, turning pinkish red. Stems (canes) from older rhizomes very vigorous, up to 1–1.5 cm thick, bearing abundant stout prickles to 1 cm long on lower parts, these irregularly set and usually absent on the nodes. Leaves short-petiolate, blades glabrous, evergreen, thick and leathery at maturity, sometimes glaucous, the midvein below much more prominent than the principal laterals; most blades oblong, rounded to broadly obtuse basally, their summits rounded and apiculate; blades sometimes lanceolate or lance-elliptic and tapering at both extremities, occasionally very broadly oval to suborbicular. Stalks of the umbels about as long as the leaf stalks. Berries glaucous, becoming shiny black at full maturity; ripening the second season after fruit-set and persisting into or through the second winter. Leaves commonly with petioles twisted in such a way that the blades are held ascending-erect on the branchlets.

In pocosins, branch bays, cypress-gum depressions, marshy stream banks, places with prolonged hydroperiods; commonly forming dense tangles, especially where no tall vegetation present on which to climb. Mostly on the coastal plain, cen. N.J. s. to s. Fla., w. to e. Tex., Ark. and w. Tenn.; Cuba, Bah. Is.

2. **Smilax glauca** Walt. SAWBRIAR. Figs. 334 and 341

Plant with long underground runners with knotty, jointed tuberous thickenings, the

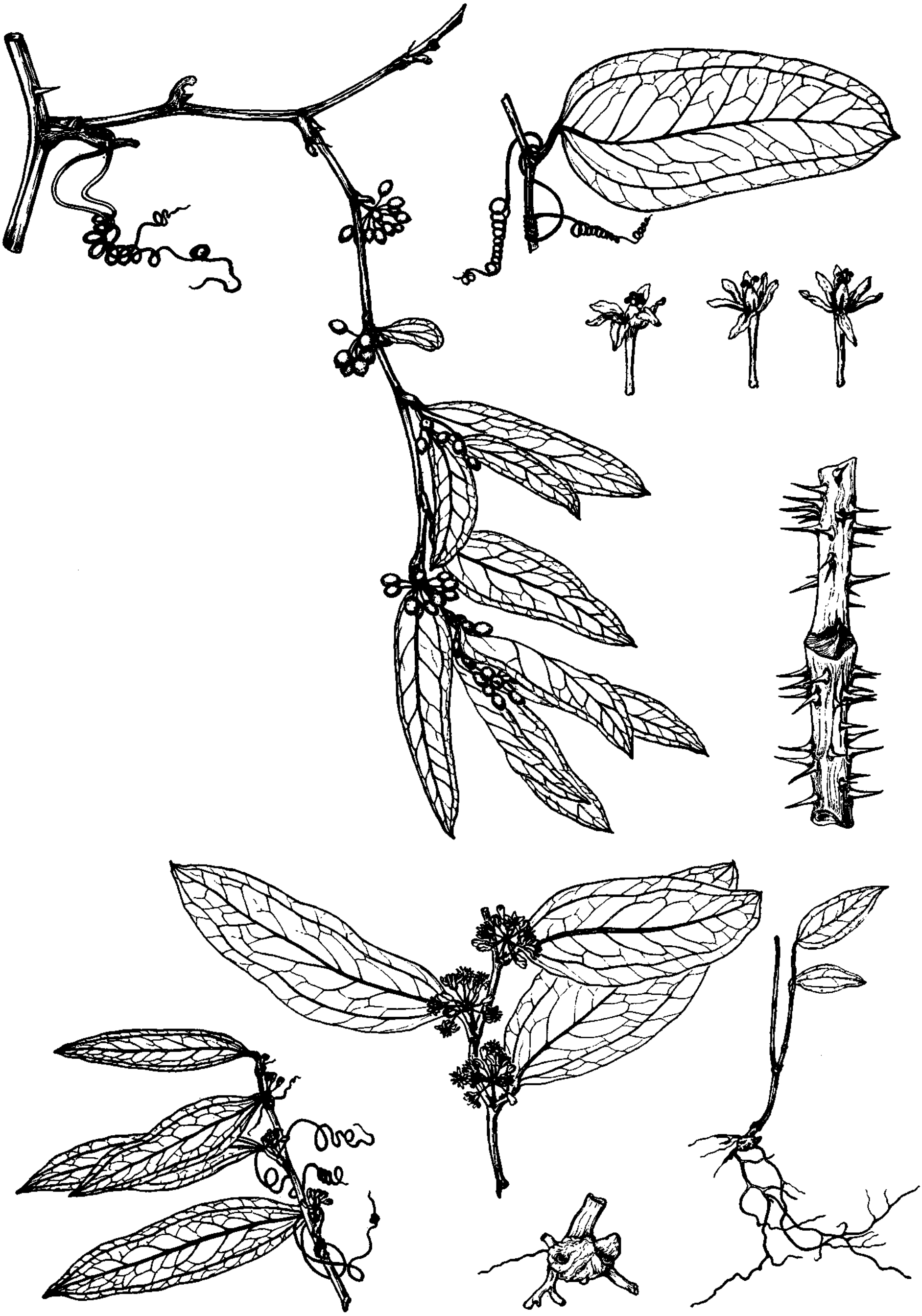


Fig. 333. **Smilax laurifolia.** (From Coker in *Jour. Elisha Mitchell Sci. Soc.* 60. 1944)

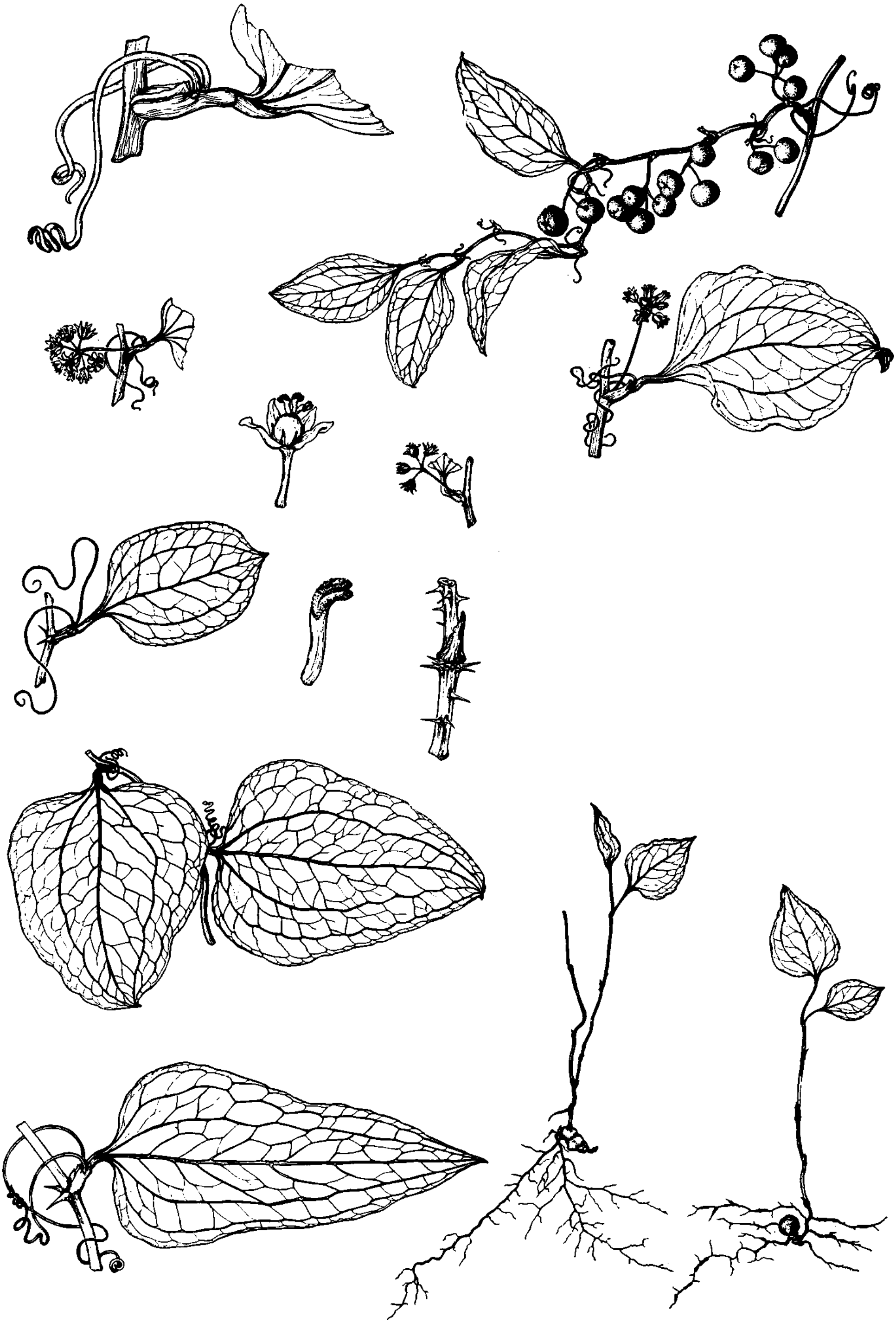


Fig. 334. **Smilax glauca.** (From Coker in *Jour. Elisha Mitchell Sci. Soc.* 60. 1944)

runners bearing small prickles. Stems glaucous, at first at least, lower portions usually thickly set with slender prickles between the nodes and stronger spines on the nodes. Leaves short-petiolate, the blades strikingly glaucous below, prevailingly broadly ovate, truncate to subcordate basally (sometimes tapered), gradually tapered distally from the broadest part near the base, usually abruptly very short-acuminate at the tip; sometimes mottled with pale areas, margins smooth; mostly deciduous in winter but sometimes wholly or partially evergreen in protected places or in the more southerly parts of the range. Stalks of the umbels slender, 1.5–3 times longer than the leaf stalks. Berries glaucous but tending to become shiny black at full maturity.

In both upland and lowland areas, old fields, woods, fence rows and thickets, wet woodlands, floodplain forests, swales. S. N.Y., N.J., Pa., s. Ohio, Ind., and Ill., s.e. Mo. and s.e. Kans., generally southward to cen. pen. Fla. and e. Tex.; Mex.

3. **Smilax smallii** Morong. GREENBRIAR. Figs. 335 and 342

Plants with thick hard, very irregularly branched tuberous rhizomes reaching as much as 6 dm long. Stems stout, the larger to 2 cm thick, climbing into the crowns of tall trees, often glaucous when young, bearing scattered prickles 3–4 mm long, more numerous, stouter, and to 1 cm long on very stout canes, on their nodes as well as internodes, distally mostly restricted to the nodes. Leaves short-petiolate, evergreen, the blades relatively thin, glabrous, lustrous green above and paler green below, prevailingly broadly lanceolate, varying to ovate-lanceolate, tapering basally into the petiole, the apices acute to acuminate; sometimes hastate basally on young shoots. Stalks of the umbel little if any longer than the leaf stalks. Berries glaucous, then becoming dark brownish red to blackish red, or black when fully ripe, ripening about a year after flowering. (*S. lanceolata* of authors, not L.)

In rich woodlands, thickets, hedgerows, floodplain forests, borders of swamps, mostly on well-drained sites, sometimes in places flooded temporarily. Mostly on the coastal plain, s.e. Va. to cen. pen. Fla., w. to e. Tex. and s. Ark.

4. **Smilax bona-nox** L. CATBRIAR. Figs. 336 and 341

Plant with both underground runners and tuberous rhizomes, the latter abundantly clothed with short prickles having dark resinous tips. Lower stems, or even upper ones as well, commonly with granular-warty or scurfy covering; prickles usually clustered at the nodes and scattered on the internodes. Leaves short-petiolate, the blades very variable, usually thickish at maturity, shiny-green above, paler below, often mottled or blotched with paler areas; broadly ovate to broadly lance-ovate, truncate to subcordate basally, mostly rounded apically and abruptly short-acuminate; more commonly hastate to fiddle-shaped, varying greatly in width; margin of the leaf with a thickened cartilaginous band much like the prominent vein more or less paralleling the margin; margin commonly stiffly spinose-ciliate. Stalks of the umbel 1.5 or more times as long as the subtending leaf stalk. Berries shiny or dull black, sometimes glaucous.

In both well-drained sites and those moist to wet, subject to temporary flooding, upland woods, old fields, thickets, hedge rows, floodplain forests, wet woodlands. Md. and Va. to s. Ind. and Mo., generally southward to cen. pen. Fla. and Tex.; Mex.

5. **Smilax tamnoides** L. GREENBRIAR, CATBRIAR. Fig. 337

Plant with short knotty underground rhizome, not tuberiferous, free of prickles. Lower part of canes with needlelike blackish prickles densely set on the internodes, sometimes also on the nodes. Branchlets terete, several–many-ribbed. Leaves short-petiolate, blades varying from broadly ovate, with subcordate or truncate bases, to hastate or fiddle-shaped, the apices very short-acuminate to moderately long-acuminate; leaf margins flat, sometimes revolute, not ribbed or banded, commonly with minute, soft, flattish outwardly directed teeth. Stalks of the umbels 1.5 or more times the length of the subtending petioles. Berries black at maturity. (Including *S. hispida* Muhl. in Torr.)

Upland woods, thickets, swales, floodplain forests, moist to wet clearings, edges of swamps, wet woodlands, creek banks. Conn., N.Y., to Minn. and Nebr., generally southward to s. cen. pen. Fla. and Tex.

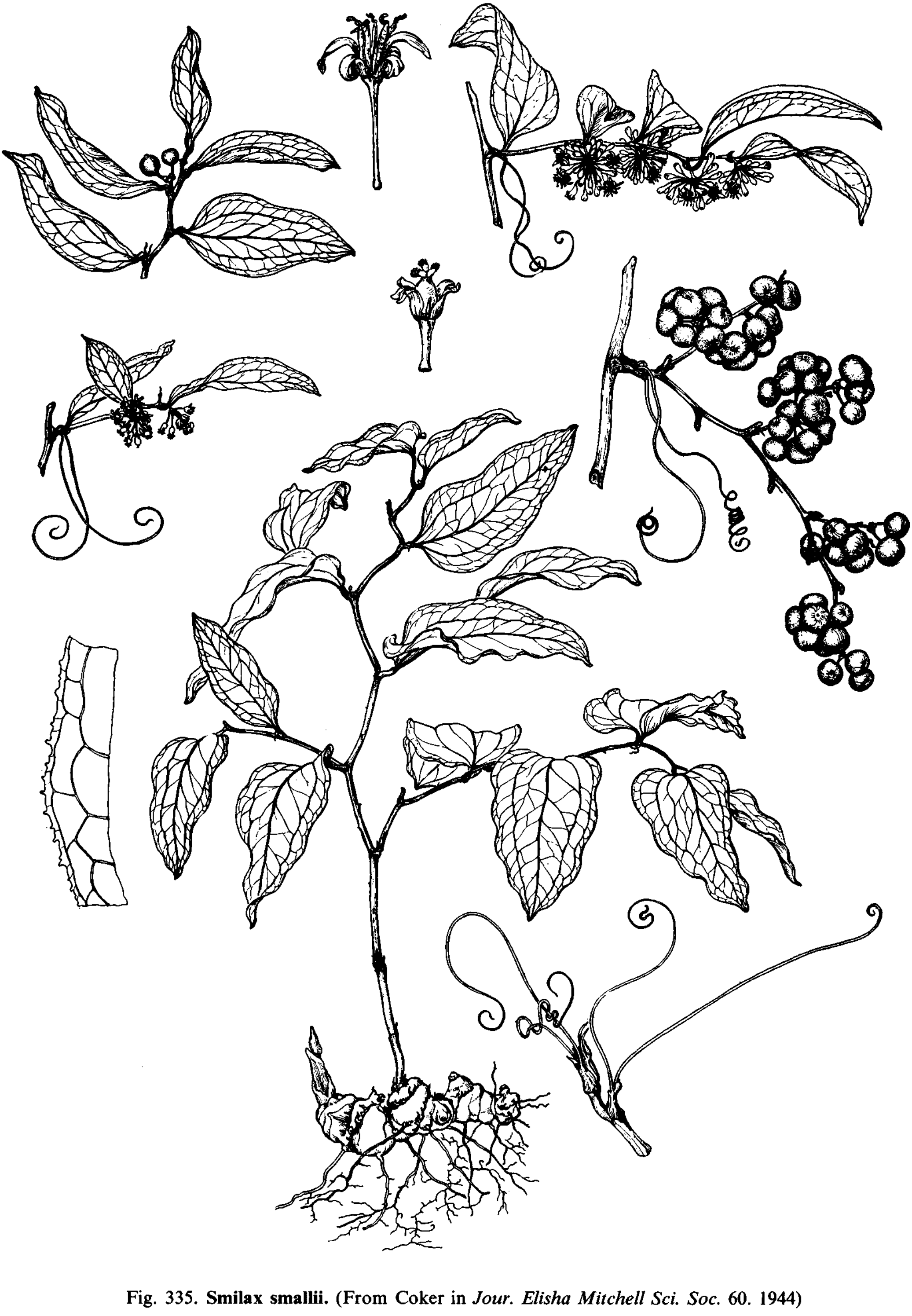


Fig. 335. **Smilax smallii.** (From Coker in *Jour. Elisha Mitchell Sci. Soc.* 60. 1944)

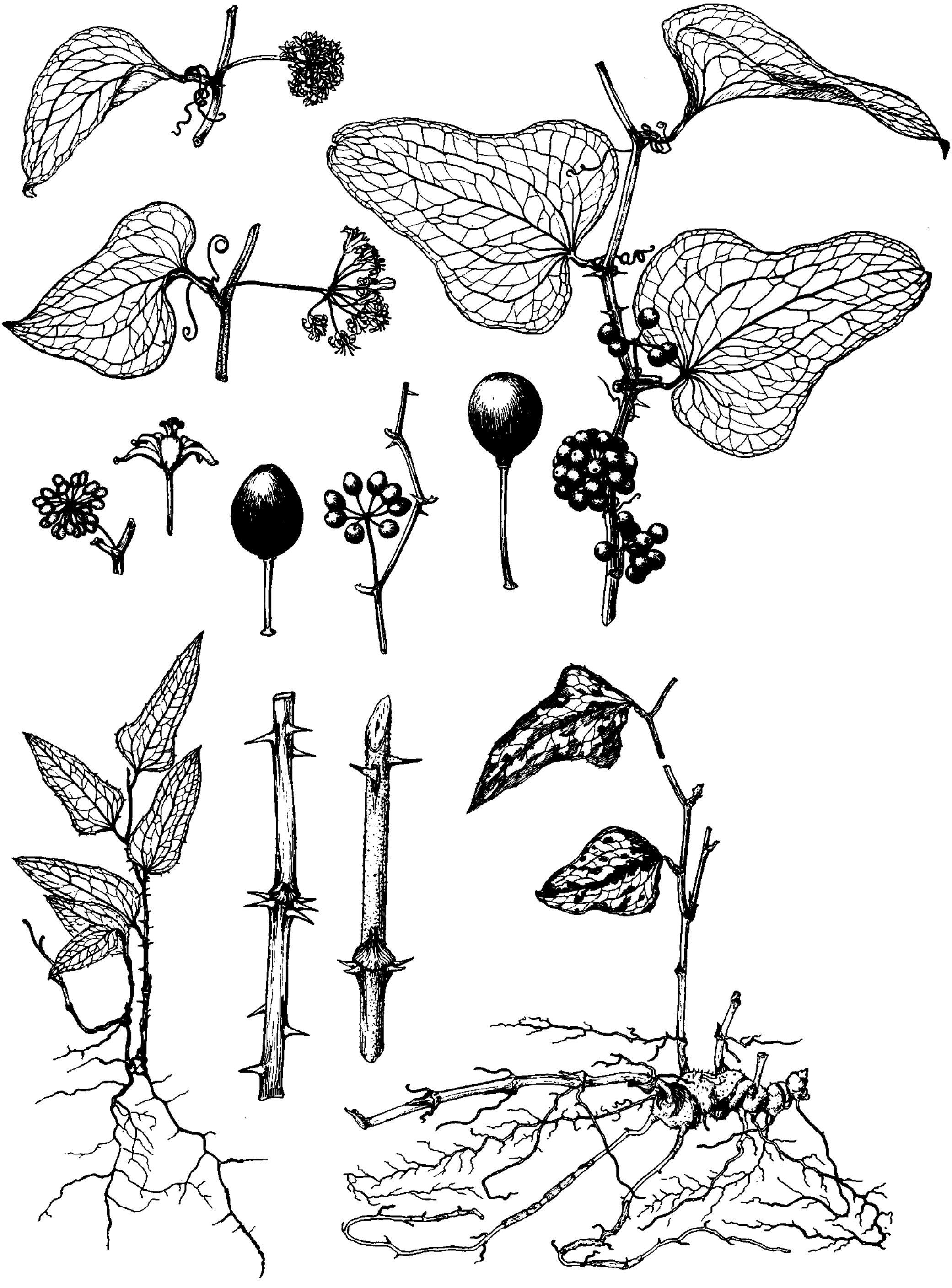


Fig. 336. **Smilax bona-nox.** (From Coker in *Jour. Elisha Mitchell Sci. Soc.* 60. 1944)

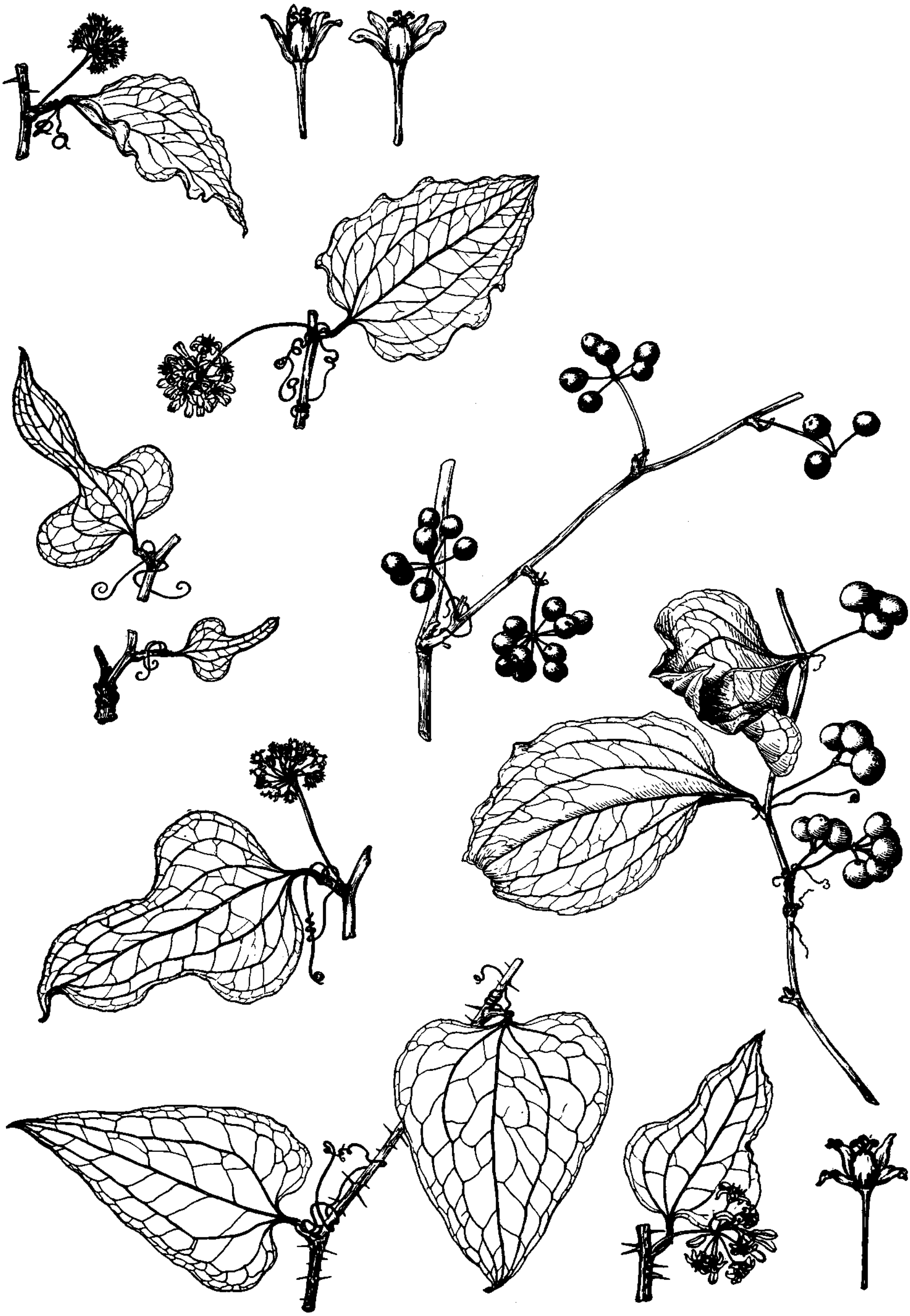


Fig. 337. **Smilax tamnoides.** (From Coker in *Jour. Elisha Mitchell Sci. Soc.* 60. 1944)

6. Smilax auriculata Walt. Figs. 338 and 342

Plants with tuberous thickened rhizomes, these in knobby chains or sometimes in knobby masses, the younger ones bearing brownish red scales. Stems clamber in intertwined tangles over low bushes or just in intertwined tangles exclusively their own. On some stream banks and in moist semiopen woodlands paralleling the streams, e.g., relatively large spring-fed streams in Florida, plants of this species grow much more vigorously and luxuriantly than on drier sites and form masses of herbage well into the trees. Leaf blades relatively small although variable in size and shape, prevailingly oblongish, without lobes at the base, or with varying degrees of basal lobing to definitely hastate; rarely lanceolate or suborbicular; basally rounded, obtuse, or cuneate, apically mostly rounded but with a very short acumination; margins thickish-banded and with a similar vein juxtaposed very very close to it. Stalks of the umbels not exceeding the short petioles of subtending leaves. Berry glaucous, ripening through reddish or purplish to purple, finally black, usually remaining glaucous, sometimes shiny.

Most commonly on deep sands of pine-scrub oak ridges and hills, coastal dunes; less frequently in seasonally wet pine savannas and flatwoods, on stream banks and adjacent moist woodlands. Chiefly outer coastal plain, N.C. to s. Fla., w. to La. and Ark; Bah. Is.

7. Smilax walteri Pursh. CORAL GREENBRIAR. Figs. 339 and 342

Plants with slender nontuberous and nonprickly rhizomes. Stems slender to moderately stout, climbing over low bushes and trees or up to about 5–6 m, more or less angled; prickles usually not numerous. Leaf blades broadly ovate to lance-ovate, truncate to rounded basally, mostly gradually tapered to the mucronate apex; margins of mature leaves thin but usually tightly and narrowly revolute so as to simulate a banded edge. Stalks of the umbels not exceeding the short petioles of subtending leaves. Ripe berries bright red; leaves usually fallen by the time the berries are fully ripe.

Usually in water, at least in places with prolonged hydroperiods, swamps. Chiefly, but not exclusively, coastal plain, N.J. to cen. pen. Fla., w. to La.; cen. Ark. and Tenn. where rare.

8. Smilax rotundifolia L. GREENBRIAR. Fig. 340

Plants with long, slender underground nontuberous, seldom prickly, rhizomes. Stems climbing to 3–6 m or somewhat more, round below, the branchlets quadrangular; prickles numerous but not crowded, never on the nodes, green with dark or light tips. Leaf blades green, not glaucous, broadly ovate, mostly truncate or broadly rounded basally, prevailingly abruptly short-acuminate apically; margins thin, sometimes narrowly and tightly revolute thus simulating a banded edge; the edge and the short petioles often with minute, short, flattish, soft, outwardly pointed teeth. Stalks of the umbel not surpassing the subtending petiole in length. Berries glaucous-black, rarely dull reddish brown.

In well-drained woods and thickets, fence and hedge rows, low seasonally wet pine flatwoods, moist to wet thickets. N.S., s. Maine and N.H., s. Ont., to s.e. Mo. and Okla., generally southward to n.e. Fla. and e. Tex.

2. Lilium (LILIES)

Perennial herbs, basally with a scaly bulb, sometimes rhizomatous as well, the stem erect, leafy. Leaves sessile, alternate or whorled, spreading or ascending. Flowers bisexual, terminating the stem singly, in umbels, racemes, or panicles, relatively large. Perianth segments 6, clawed or sessile, erect, spreading or recurved, yellow to orange or red, more or less spotted or flecked with brown or purple. Stamens 6, the filaments long, anthers attached near the middle. Ovary 3-locular, bearing numerous ovules; style 1, elongate, stigma 3-lobed. Fruit a loculicidal capsule, the numerous seeds packed in 2 rows in each locule.

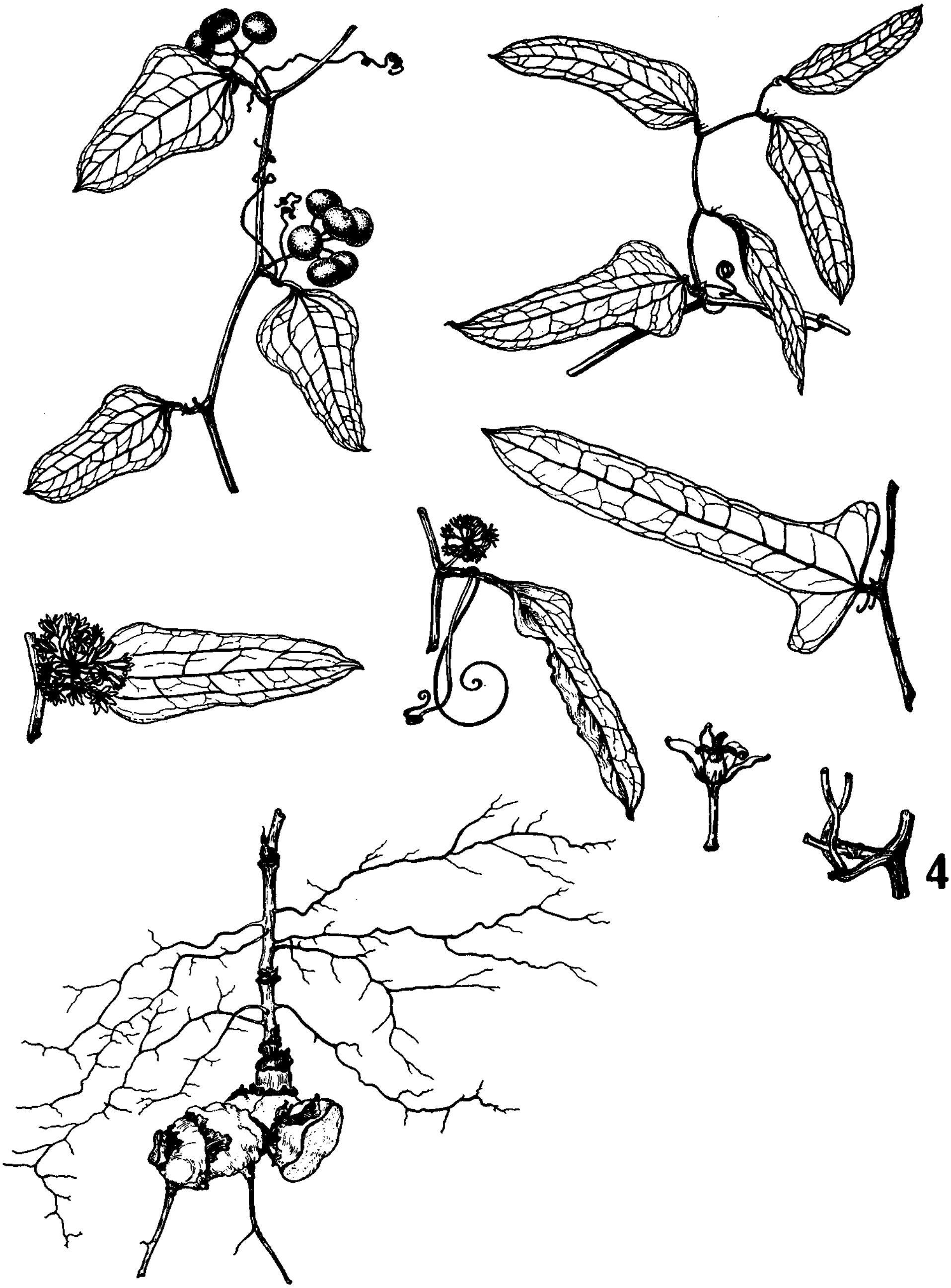


Fig. 338. **Smilax auriculata.** (From Coker in *Jour. Elisha Mitchell Sci. Soc.* 60. 1944)

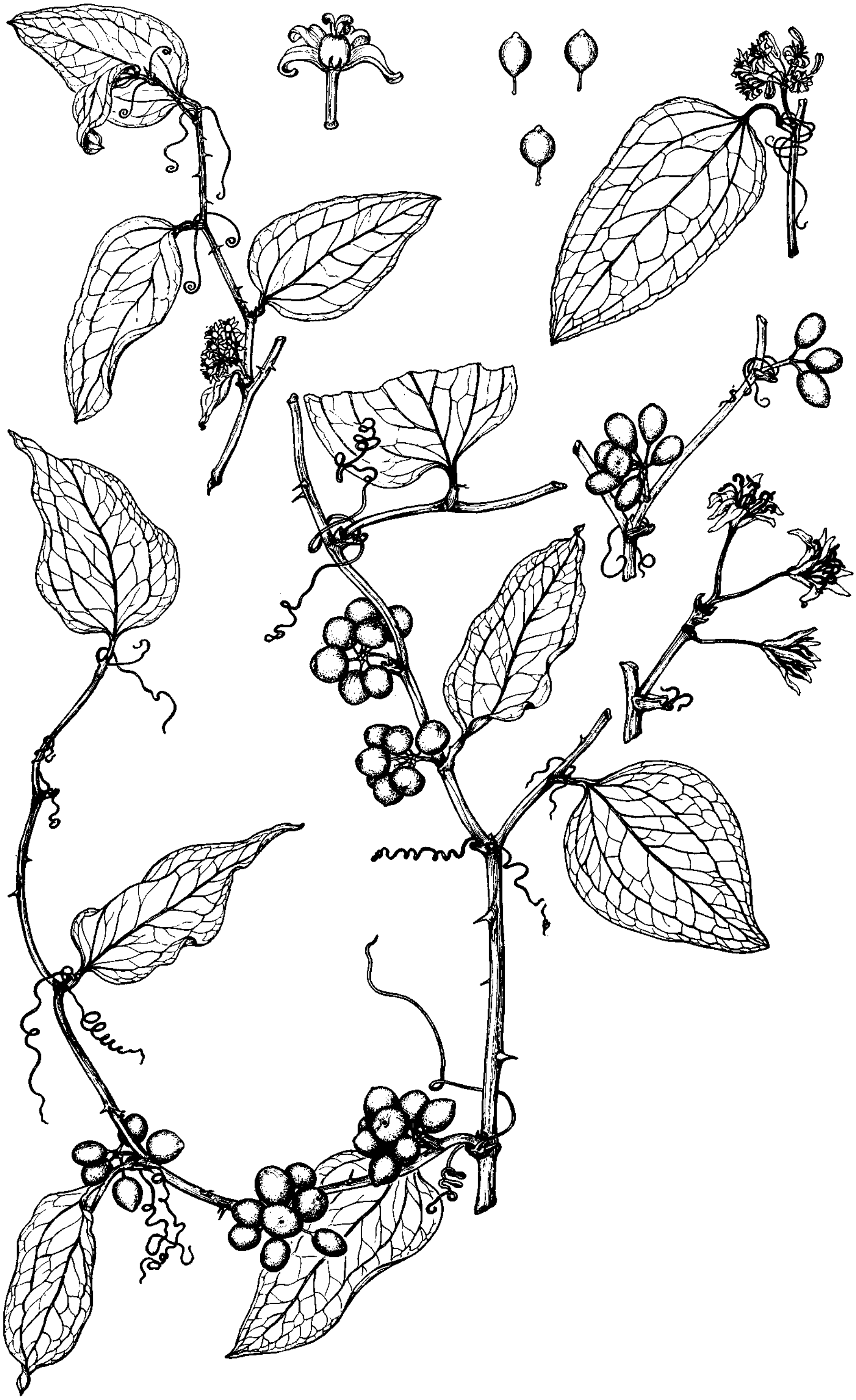


Fig. 339. **Smilax walteri.** (From Coker in *Jour. Elisha Mitchell Sci. Soc.* 60. 1944)

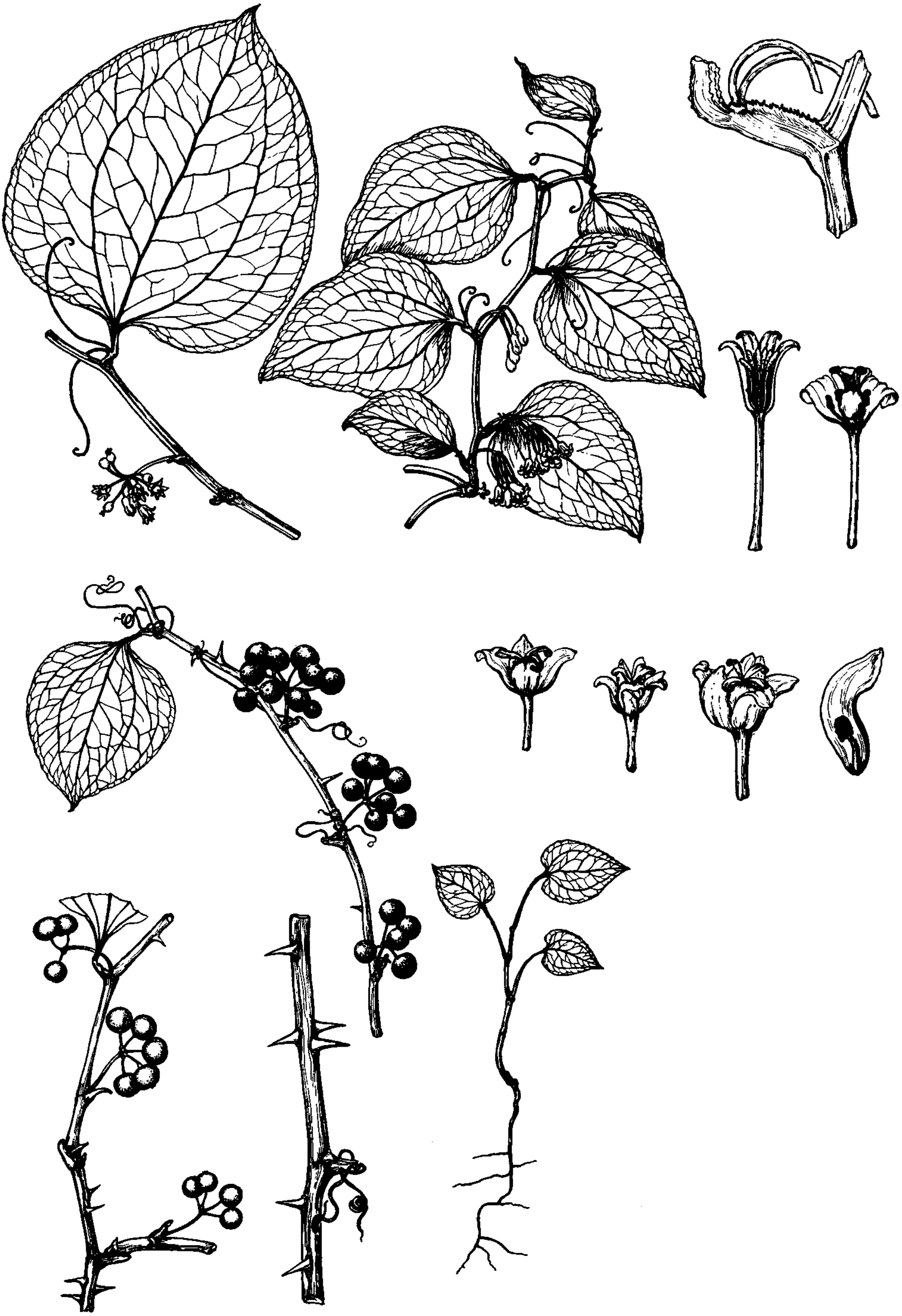


Fig. 340. **Smilax rotundifolia.** (From Coker in *Jour. Elisha Mitchell Sci. Soc.* 60. 1944)

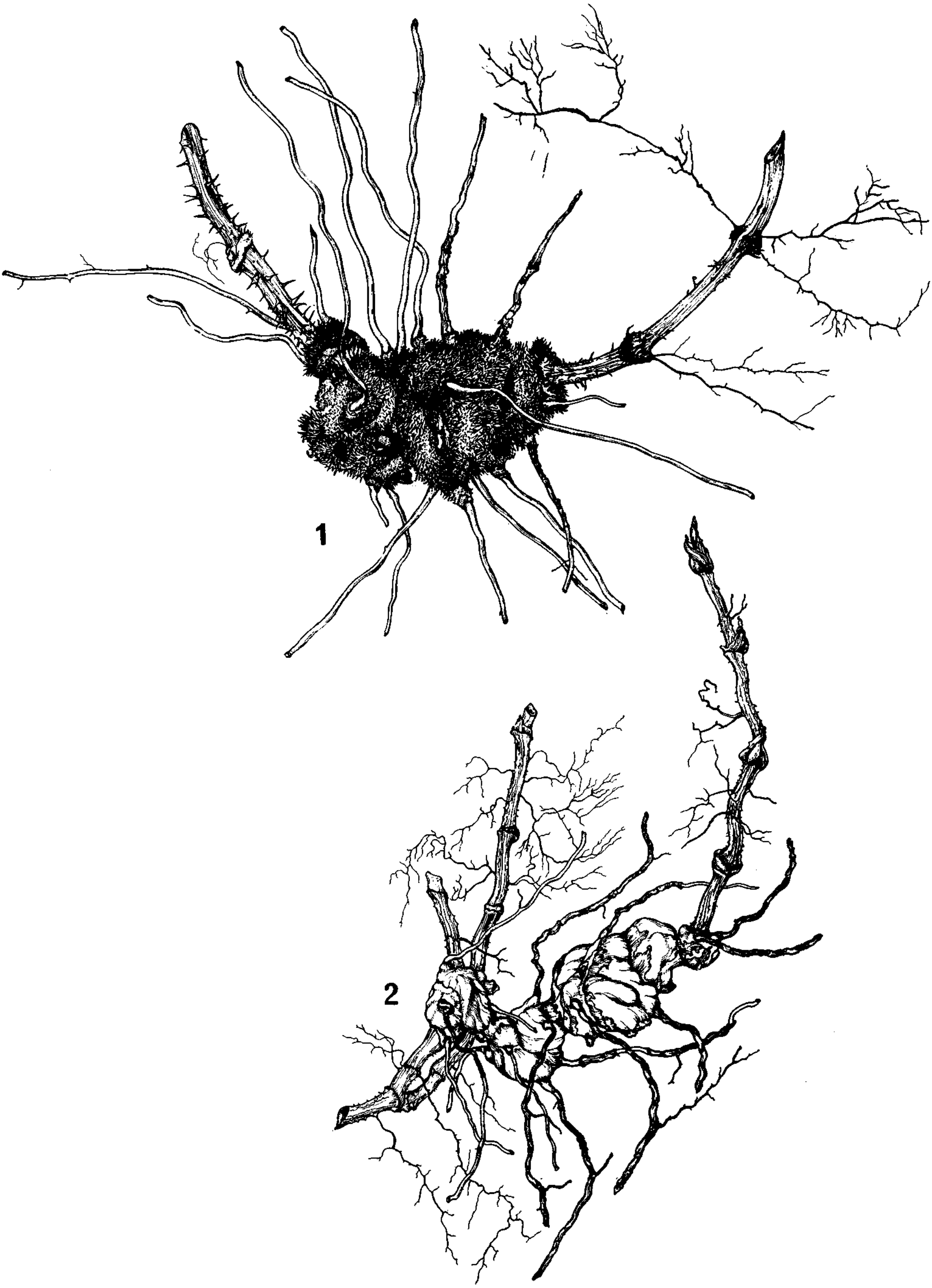


Fig. 341. Tuber and runners of: 1, **Smilax bona-nox**; 2, **Smilax glauca.** (From Coker in *Jour. Elisha Mitchell Sci. Soc.* 60. 1944)

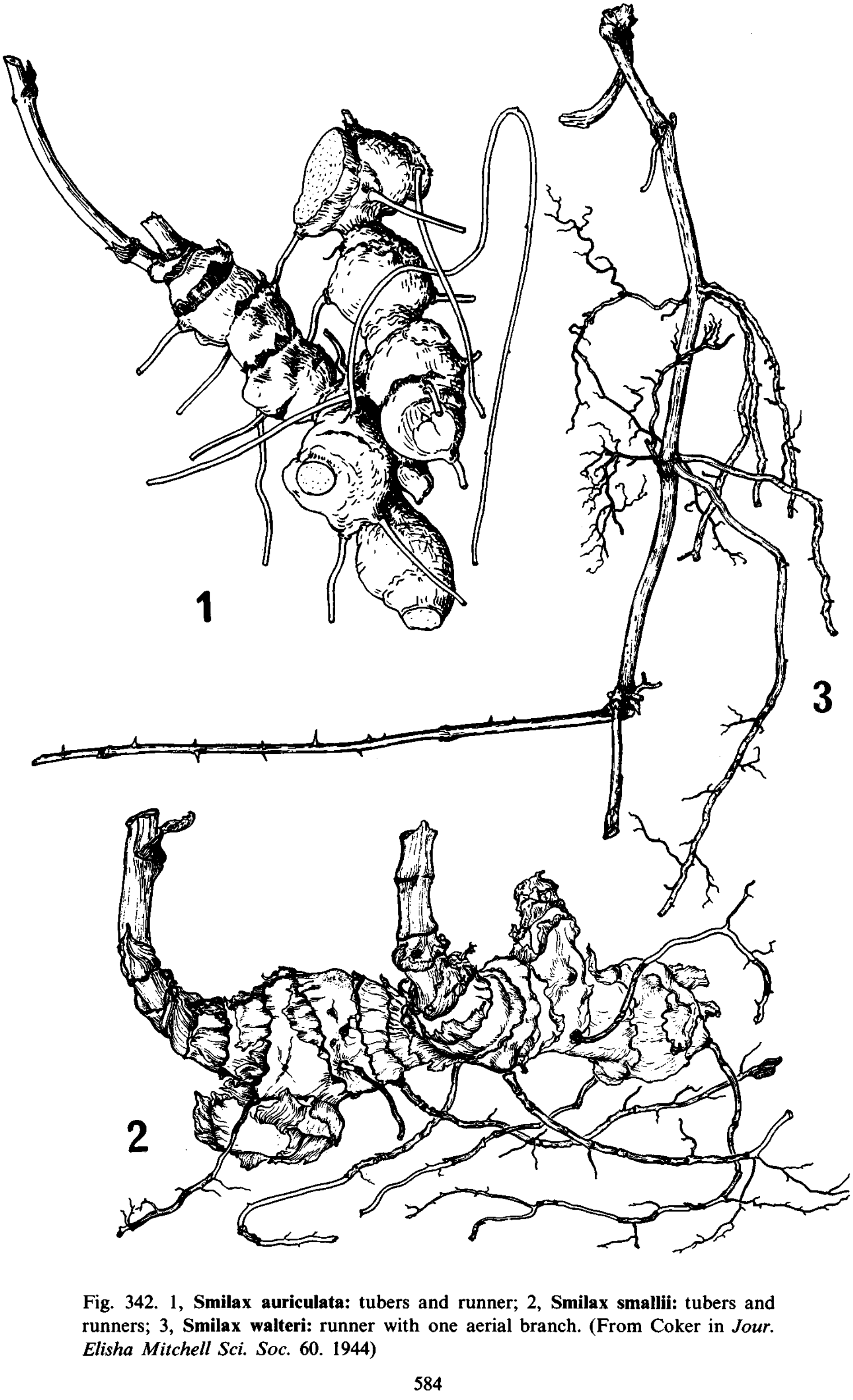


Fig. 342. 1, **Smilax auriculata:** tubers and runner; 2, **Smilax smallii:** tubers and runners; 3, **Smilax walteri:** runner with one aerial branch. (From Coker in *Jour. Elisha Mitchell Sci. Soc.* 60. 1944)

1. Leaves all alternate; flowers erect; perianth segments distinctly clawed. 1. *L. catesbaei*
1. Leaves, some of them, whorled; flowers nodding, perianth segments not clawed.
  2. Perianth segments buff yellow to golden yellow, flecked with brownish red spots; plant with both bulbs and rhizomes. 2. *L. iridollae*
  2. Perianth segments not yellow or if yellow then flecked with purple spots; plant without rhizomes.
    3. Larger leaves oblanceolate to narrowly obovate. 3. *L. michauxii*
    3. Larger leaves lanceolate to elliptic.
      4. Stamens and style not exserted or barely exserted from the slightly recurved perianth segments. 4. *L. canadense*
      4. Stamens and style long-exserted from the strongly recurved perianth segments. 5. *L. superbum*

1. **Lilium catesbaei** Walt. PINE LILY.

Bulb 1–3 cm across, the scales narrow. Stems mostly 5–7 dm tall. Leaves alternate, ascending or appressed, linear-lanceolate to linear, the lower to about 8 cm long, gradually reduced upward. Flower solitary, erect. Perianth segments spreading, markedly clawed, blades lanceolate to ovate, acuminate apically, orange to orange-red except basally, there yellow and purple-spotted; blades of outer segments 1–2 cm wide at their widest places, the inner 1.5–3.5 cm wide. Capsule nearly oblong, 4–5 cm long, 1–1.5 cm across.

Pine savannas and flatwoods, bogs. Coastal plain, s.e. Va. to Fla., w. to La.

2. **Lilium iridollae** M. G. Henry. Fig. 343

Bulb globose, not exceeding 2 cm across at time of anthesis, with a rhizome connecting several bulbs. Stem 5–20 dm tall, slightly roughened and rooting near the base, lightly flecked and suffused with brown below, smooth and light green distally. Leaves whorled or whorled above and alternate below, oblanceolate to obovate, rarely elliptic, 5–9 cm long, 1.3–2.5 cm wide, somewhat roughened on the margin and proximally on the veins below; upper stem leaves essentially bracteal. Flowers solitary, sometimes several, nodding. Perianth segments strongly recurved, the inner 7.5–10 cm long, 1.5–2.5 cm wide, the outer slightly longer and wider; all buff yellow to golden yellow above, deeper yellow along the median line, conspicuously spotted with brownish red, and near the apex obscurely flecked or stippled with pinkish red; below buff to yellow with green base. Capsule broadly oblong-elliptic, 3–4 cm long, 2–2.5 cm across.

In muck, sphagnous banks of wooded streams, open bogs, savannas. Fla. Panhandle, Walton Co., to Baldwin Co., Ala.

3. **Lilium michauxii** Poir. CAROLINA LILY.

Bulb 1.5–2.0 cm across. Stem 5–12 dm tall. Leaves glaucous, near the middle of the stem in whorls of 4–15, a few much smaller alternate leaves below and sometimes above, the larger oblanceolate to narrowly obovate, obtuse to acute apically, cuneate basally, 6–12 cm long, 1.0–2.5 cm wide. Flowers 1–2, rarely more, nodding. Perianth segments orange-red, purple-spotted above on at least the lower half, a narrow wedge-shaped green area basally; strongly recurved from about the middle; elliptic-lanceolate, acute to acuminate, 5.5–8 cm long, 1–2 cm wide. Capsule 3–4.5 cm long.

Upland woodlands and thickets, open mountain slopes and summits, bogs. Coastal plain, s.e. Va. to Fla. Panhandle, w. to La., in the mts. southward from W.Va. and Va.

4. **Lilium canadense** L. YELLOW LILY.

Stem slender, 6–15 dm tall. Leaves mostly in whorls of 4–12, the lowest ones alternate, the uppermost sometimes alternate; lanceolate to linear-elliptic, widest at or below the middle, tapering to both ends, scabrous on the margin and on the nerves beneath, the larger 8–15 cm long, 8–20 mm wide. Flowers sometimes solitary, 3–5 in an umbel, or few in a subterminal umbel, few in a raceme above it, nodding. Perianth segments yellow or orange-yellow, varying to nearly red, marked with purple spots on the upper surface,

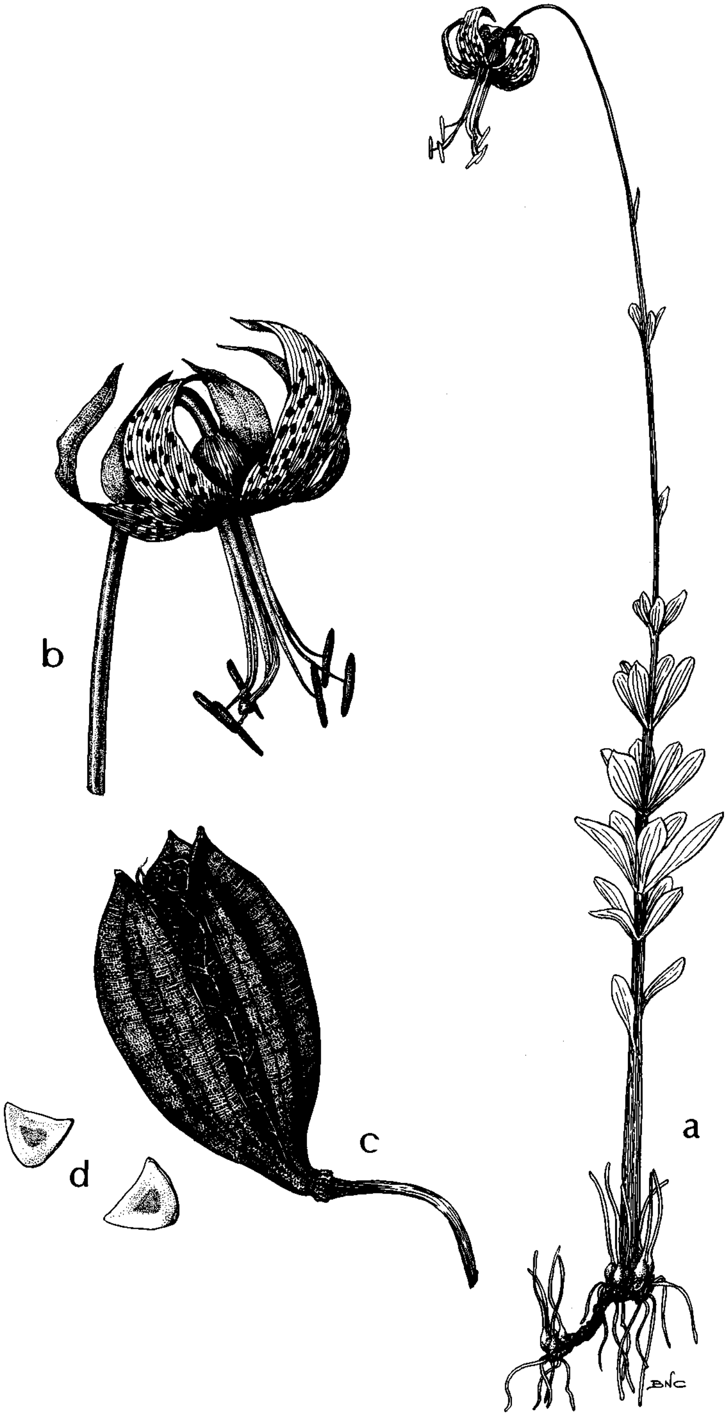


Fig. 343. **Lilium iridollae:** a, habit; b, flower; c, capsule; d, seeds.

greenish at the very base, slightly recurved only at the tips, 5–8 cm long, 1–2 cm wide, long-acute to acuminate apically.

Wet meadows, bogs, balds, low thickets, wet woodlands. Que. and Maine to Minn., Ind., Ohio, s. to Ala.

5. **Lilium superbum** L. TURK'S CAP LILY.

Stem stout, to 2.5 m tall. Leaves mostly in whorls of 5–20, a few uppermost ones alternate and the bracteal leaves of the inflorescence alternate; lanceolate or elliptic, tapering to both ends, scabrous on the margins and often on the veins beneath. Flowers occasionally solitary, usually several–many, perianth segments orange or orange-red, spotted with purple, bright green at the base on the upper surface, strongly recurved, lanceolate, 6–9 cm long, about 2.5 cm wide.

Wet meadows, swales, swampy woodlands, coves. N.B. to Minn., s. to the Fla. Panhandle and Ala.

3. Medeola

Medeola virginiana L. INDIAN CUCUMBER ROOT.

Perennial herb with a single slender stem to about 8 dm tall arising from a crisp horizontal white tuber (with the taste of cucumber). Stem somewhat cottony-pubescent, especially near the base, bearing a whorl of 5–9 lanceolate to obovate leaves about midway its length and another whorl of 3 (rarely more) obovate leaves at the summit, the latter subtending an umbel of small flowers whose stalks recurve so as to place them below the subtending leaves. Flowers bisexual, usually 3–10. Perianth greenish yellow, the segments separate, elliptic, 6–8 mm long, 2–4 mm wide, spreading to reflexed. Stamens purple, filaments 4–6 mm long, 2–4 mm wide, anthers 1–2 mm long. Stigma sessile, of 3 threadlike widely spreading parts. Fruiting stalk erect, fruit a dark purple globose berry, 6–8 mm across, 6-seeded. Seeds lustrous, reddish brown, about 3 mm long.

Moist wooded slopes, wettish bottomland woodlands, edges of bogs. Que. and Ont. to Minn., generally southward to Ga., Fla. Panhandle, and La.

4. Erythronium (DOG-TOOTH VIOLET, ADDER'S TONGUE, TROUT LILY)

Glabrous perennial herb with a bulb deep-seated in the substrate (rarely also with stolons). From the bulb a single stem bearing 2 leaves (or one leaf the first year from seed), the stem virtually all within the substrate and the leaves therefore seemingly basal; leaves sheath the base of a 1-flowered scape. Leaves lanceolate to oblanceolate or elliptic, commonly mottled with brown or purplish brown (often obscured in drying). Flower bisexual, usually nodding. Perianth lilylike, segments 6, recurved or spreading, separate, (ours) yellow with red-brown markings, the pigmentation varying greatly within a given taxon, a pale or white spot centrally on the lower interior part of the segment. Anthers yellow, brown or purple. Ovary 3-locular, with several–many ovules. Capsule oblong to obovate, loculicidal.

Authors have differed considerably in their treatment of the yellow-flowered Erythroniums of our range. The most recent analysis is that of Clifford R. Parks and James W. Hardin, "Yellow Erythroniums of the Eastern United States," *Brittonia* 15: 245–259 (1963).

Although Erythroniums mostly inhabit mesic woodlands, they do occur in bottomland woodlands, sometimes subject to temporary flooding, and commonly on creek banks. The brief synopsis below is taken from Parks and Hardin, omitting descriptions.

1. Ovary and capsule truncate, rounded, apiculate or beaked at the apex; mature capsules held well off the ground; stolons usually 1 or more; petals usually auricled at the base.

2. Capsule with a well-developed beak at the apex; petal auricles well developed and encircling the base of a filament. 1. *E. rostratum*

2. Capsule truncate, rounded or apiculate at apex; petal auricles small and not encircling the base of a filament, or lacking.
   3. Apiculus of capsule poorly developed or lacking. 2a. *E. americanum* subsp. *americanum*
   3. Apiculus of capsule usually well developed. 2b. *E. americanum* subsp. *harperi*

1. Ovary and capsule distinctly indented at the apex; mature capsules usually reclining on or just above the ground on pendant stalks; stolons lacking or a single one per bulb; petals lacking auricles at the base.
   4. Stolons absent. 3a. *E. umbilicatum* subsp. *umbilicatum*
   4. Stolons present. 3b. *E. umbilacatum* subsp. *monostolum*

1. Erythronium rostratum Wolf.

Rich woods and ravines. N. and cen. Ala. and Tenn.; also La., Ark., e. Okla., s. Mo., and s.e. Kan.

2a. Erythronium americanum Ker. subsp. **americanum.**

Rich woods, ravines, and creek banks. N.B. to Ont., Minn., s. to N.C., Tenn., Ark., and Okla.

2b. Erythronium americanum subsp. **harperi** (Wolf) Parks & Hardin.

Shaded slopes, rich woods or ravines. N. Ala. and Tenn., n.e. Miss.

3a. Erythronium umbilicatum Parks & Hardin subsp. **umbilicatum.** Fig. 344

Rich woods, floodplains, slopes of creeks and streams, small ravines, or in drier exposed rocky slopes and granitic rock outcroppings. E. W.Va., w. Va., e. Tenn., N.C., S.C., cen. Ga., e. Ala., Fla. Panhandle.

3b. Erythronium umbilicatum subsp. **monostolum** Parks & Hardin.

Rich woods and slopes of upper coves under hardwoods or evergreens, sometimes high open areas. High mts. and high coves, e. Tenn., w. N.C.

5. Uvularia (BELLWORT, MARYBELLS)

Uvularia floridana Chapm.

Glabrous perennial with slender whitish rhizomes, the stem and lower leaf surfaces slightly glaucous. Stem 2.5–4.0 dm high or a little more, 3-angled above, simple or mostly only 2–3 branched near the summit. Lower leaves consisting of membranous, acuminate-tipped sheaths only; upper leaves sessile, narrowly to broadly elliptic, the base tapering to rounded, the apex acute to rounded, mostly 4–7 cm long and 1.8–3.0 cm wide; margins scarious and very minutely but densely denticulate. Flower borne on a short branchlet bearing a foliaceous bract, the flower stalk above the bract 2–8 mm long, the branchlet and flower stalk usually recurved thus the flower drooping. Perianth segments mostly 2.2–3.0 cm long, pale yellowish or yellowish white. Stamens 6, free from the perianth segments, the filaments slightly flattened and dilated below, short, much exceeded in length by the anthers. Pistil superior, 3-carpellate, 3-loculed, sessile, winged, rather abruptly tapering to apex and base, the 3 sides each slightly concave, beaked at the summit. (*Oakesiella floridana* (Chapm.) Small)

Wet bottomland woodlands, floodplain woodlands. Coastal plain, S.C. to Fla. Panhandle, Ala., Miss.

Four additional species of *Uvularia* occur in our range but generally occur on dry to moist but well-drained sites.

6. Aletris (COLIC-ROOTS, STAR-GRASSES)

Perennial herbs with thickish short rhizomes, the leafy portion of the stem short and the several–numerous leaves very close-set upon it. Leaves sessile, flat, linear-elliptic, elliptic, or lanceolate. Flowering stem (scape) with scattered small bracts below the

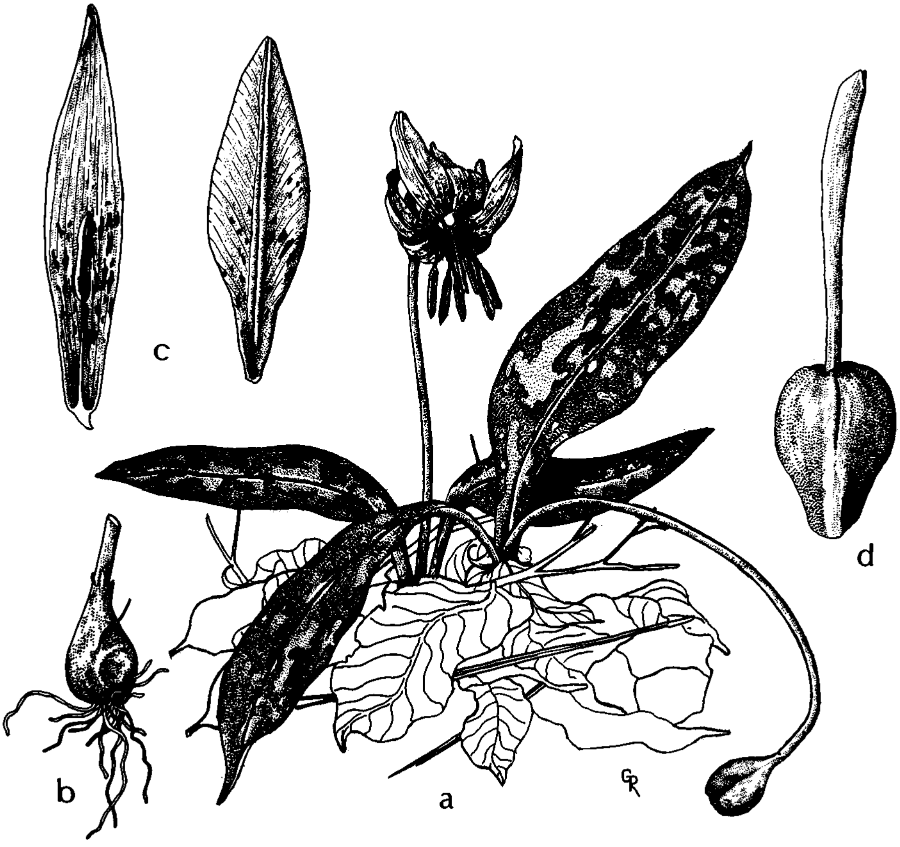


Fig. 344. **Erythronium umbilicatum** *subsp.* **umbilicatum:** a, habit; b, bulb; c, left to right, outer perianth segment with stamen attached and inner perianth segment; d, pistil.

inflorescence, the latter a terminal spikelike raceme, the axis of the raceme more or less glutinous. Flower stalks very short, 2 subulate bracts, one longer than the other, below it or on it. Perianth tubular, 6-lobed at the summit, attached to the base of the ovary, the outer surface very much roughened and more or less glutinous. Stamens 6, inserted on the perianth, usually not exserted from it. Ovary partly inferior, style subulate with 3 stigmas. Fruit an ovoid, beaked capsule, enclosed by the persistent and withered perianth. Seeds amber, ribbed, lustrous, mostly oblique, 0.5–0.7 mm long.

1. Perianth white or creamy white.
  2. Lobes of the perianth broadly deltoid, the width of the base equal to the length or near so, sometimes greater; perianth at anthesis campanulate, as broad as long or nearly so, in fruit narrowed above the base but not constricted. 1. *A. obovata*
  2. Lobes of the perianth narrowly deltoid, longer than broad, spreading; perianth at anthesis nearly cylindric, more than twice as long as broad, in fruit markedly constricted above the middle. 2. *A. farinosa*
1. Perianth yellow (commonly fading in drying).
  3. The perianth at anthesis short-cylindric or campanulate, not over twice as long as broad, the lobes not spreading. 3. *A. aurea*
  3. The perianth at anthesis long-cylindric, more than twice as long as broad, the lobes somewhat spreading. 4. *A. lutea*

1. **Aletris obovata** Nash.

Scape 4–7 dm tall. Leaves 2–7 cm long and 1–1.5 cm wide. Flowers white or creamy-white. Perianth 4–6 mm long, campanulate at anthesis, as broad distally as long, the lobes broadly deltoid, usually turned inward somewhat; in fruit the perianth narrowed but not usually constricted above the bulbous basal portion. (See note under *A. lutea* below.)

Pine savannas and flatwoods, commonly inhabiting dryish to moist, shallow roadside ditches and banks. Coastal plain, S.C. to cen. pen. Fla., w. to s. Miss.

2. **Aletris farinosa** L.

Scapes 4–10 dm tall. Leaves 4–15 cm long and mostly 1–2 cm wide. Flowers white or creamy-white. Perianth 6–8 mm long, cylindric at anthesis, mostly more than twice as long as broad, the lobes narrowly deltoid, spreading; in fruit usually constricted above the bulbous basal portion.

Bogs, meadows, upland open woodlands, barrens. S. Maine to Minn., s. to Ga. (Fla.?), and e. Tex.

3. **Aletris aurea** Walt.

Scapes 2–8 dm tall. Leaves 2–8 cm long and 1–2 cm wide. Flowers golden-yellow. Perianth 6–7 mm long, short-cylindric or -campanulate at anthesis, not over twice as long as broad, the lobes mostly broadly deltoid, erect; in fruit narrowed above the bulbous base but not constricted.

Pine savannas and flatwoods, bogs. Chiefly coastal plain, s. Md. to cen. pen. Fla., w. to s.e. Okla. and e. Tex. Within the same area, season of flowering is later than for other species of *Aletris.*

4. **Aletris lutea** Small.

Scapes 5–10 dm tall. Leaves 4–15 cm long, mostly 1–2 cm wide. Flowers golden-yellow. Perianth 6–8 mm long, cylindric at anthesis, mostly more than twice as long as broad, the lobes deltoid, somewhat spreading; in fruit narrowed above the bulbous base but scarcely constricted.

Usually in seasonally wet pine flatwoods and savannas, bogs, sometimes in shallow water and in soft mucky substrate of open cypress depressions. Coastal plain, Ga. to s. Fla., w. to La.

This and *A. obovata* frequently hybridize, especially when growing together in mechanically disturbed sites or on roadsides. The intermediates have pale yellow flowers and are thus easily noticed in the field.

7. Zigadenus (DEATH CAMUS)

Glabrous, sometimes glaucous, perennials with rhizomatous, bulbous or semibulbous bases. Stems more or less leafy. Inflorescence racemose or paniculate. Flowers bisexual or unisexual. Perianth segments 6, separate, each with 1 or 2 glands near the base. Stamens 6, free from the perianth segments and about as long as the segments. Capsules 3-lobed, 3-locular, the 3 styles persistent and the withered perianth segments persistent below the capsule.

1. Plant with thick, hard rhizomes more or less coated with fibers of old leaf bases; inner perianth segments clawed, all or most bearing 2 glands near the base of the blade. 1. *Z. glaberrimus*
1. Plant with a bulbous or semibulbous base; perianth segments not clawed, bearing a single (sometimes obscure) gland near the base.
  2. Inflorescence racemose; flowers bisexual. 2. *Z. densus*
  2. Inflorescence of panicled racemes; lower flowers of an inflorescence branch bisexual and fruit-producing, the upper usually staminate or staminate with nonfunctional pistils. 3. *Z. leimanthoides*

1. **Zigadenus glaberrimus** Michx.

Plant relatively coarse, with a thick hard rhizome usually clothed with fibers of old leaf bases, clump-forming. Stems 8–12 dm tall, leafy, the leaves gradually reduced upward, the longer to 4 dm long and 1.5 cm wide, keeled on the back, striate. Panicle 1.5–4 dm long, pyramidal in outline. Outer perianth segments not clawed or obscurely so, oblong-elliptic, the inner clawed, the blades lance-ovate to ovate, all usually with a pair of glands on the upper surface near the base and acute to acuminate apically; white or nearly so at anthesis, sometimes becoming greenish or purplish green, sometimes finally turning brown, withering somewhat but persistent below the fruit; 1–15 mm long. Capsule lance- to ovate-conic, about 1 cm long, barely as long as the perianth segments which ascend around it.

Bogs, wet pine savannas and flatwoods, shrub bogs. Coastal plain, s.e. Va. to Fla. Panhandle, w. to s.e. Tex.

2. **Zigadenus densus** (Desr.) Fern. BLACK SNAKEROOT, CROW-POISON. Fig. 346

Plant relatively slender, with a semibulbous base usually clothed with broad bladeless old leaf scales but not fibrous. Stems to 15 dm tall. Leaves elongate-linear mostly near the base or on the lower portion of the stem, bracteal leaves above. Inflorescence racemose, subcylindric or narrowly conical, to 10 cm long or a little more and 7 cm wide. Perianth segments at first creamy-white becoming roseate to purplish after anthesis (the developing capsules similarly colored), not clawed but sometimes narrowed gradually at the base, variable in shape, ovate, elliptic, or obovate, obtuse to rounded apically, 4–5 mm long, each with a small gland at the base (obscured in drying or sometimes apparently not present). Capsules purplish, becoming brown, exceeding the persistent perianth, about 12 mm long including the persistent styles, 3-lobed, deep narrow furrows between the broadly rounded backs of the lobes, the lobes commonly oblique. (*Tracyanthus angustifolius* (Michx.) Small)

Pine savannas and flatwoods, bogs. Coastal plain, s.e. Va. to Fla., w. to e. Tex.

3. **Zigadenus leimanthoides** Gray.

Plant semibulbous at base, the bulb clothed with fibers from old leaf bases. Stem 4–15 dm tall. Leaves elongate-linear, mostly near the base of the stem, to 5 or 6 dm long, and 4–12 mm wide. Inflorescence of panicled racemes, to 3 dm long. Perianth segments creamy white, yellow, or greenish white, ovate-elliptic, 3–4 mm long, each with a deeper yellow spot (obscured in drying) near the base. Lower flowers of an inflorescence branch bisexual and fruit-producing, the upper usually staminate or staminate and with nonfunctional pistils. Capsules slender-conic. (*Oceanoros leimanthoides* (Gray) Small)

Bogs, seasonally wet pinelands. Coastal plain, L.I. to Del. and Ga. to La., mts. Va., W.Va. to Ala.

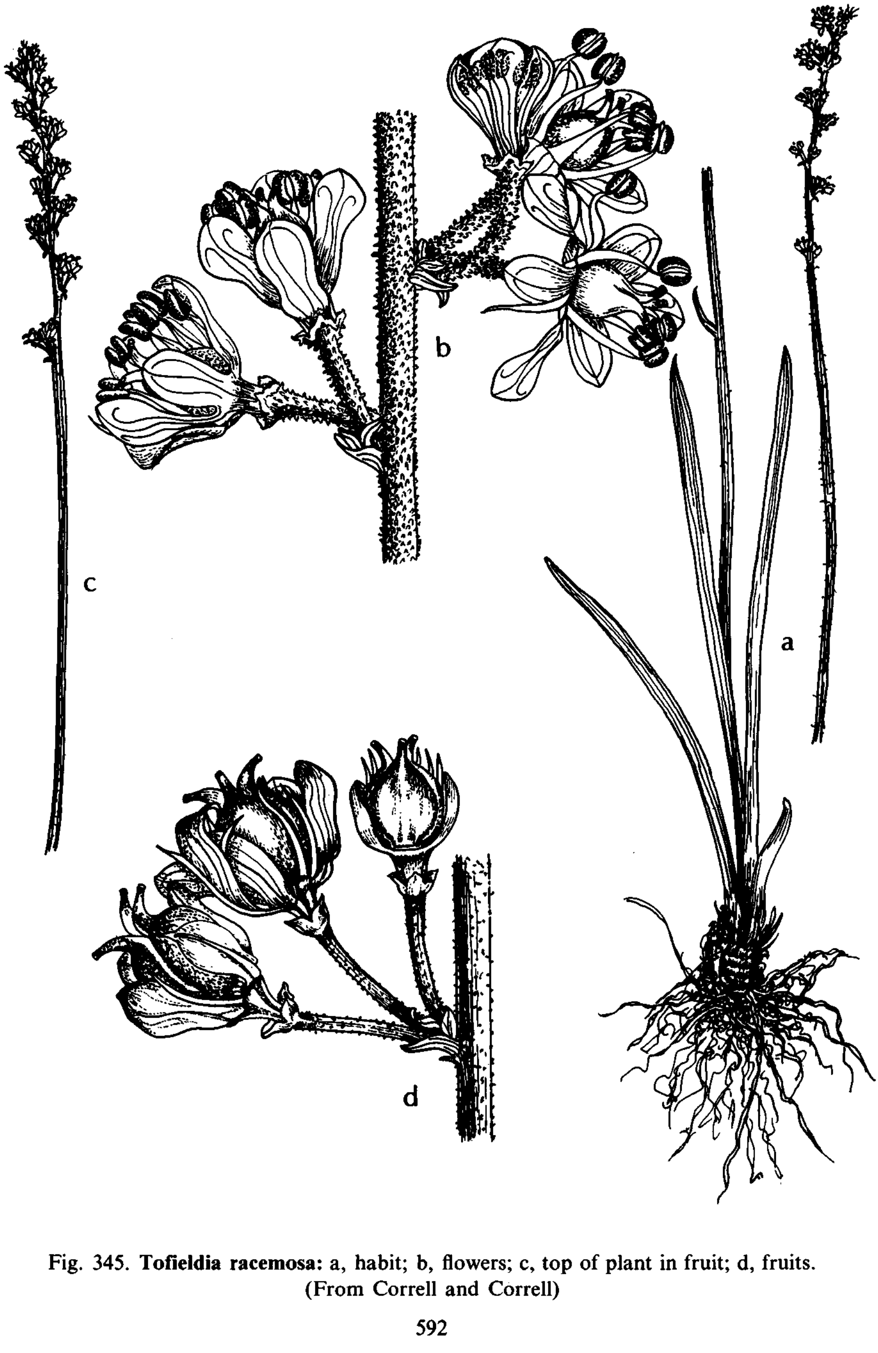


Fig. 345. **Tofieldia racemosa:** a, habit; b, flowers; c, top of plant in fruit; d, fruits. (From Correll and Correll)

8. Melanthium

Melanthium virginicum L. BUNCHFLOWER.

Perennial, rather coarse, the rootstock stout and the base of the stem often somewhat bulblike and commonly clothed with brown fibers derived from old leaf bases. Stem 1–2 m tall, roughish downy or scurfy on its upper parts. Leaves, at least the lower, sheathing at the base, elongate, the lower much larger and close-set, gradually reduced upward and distant, 3–8 dm long, 4–30 mm wide, striate. Inflorescence a panicle of longish bracteate racemes, pyramidal in outline, the branches ascending. Perianth segments 6, separate, clawed at the base, the blades ovate, cream colored changing to greenish or purplish, pubescent below, 5–8 mm long, each with a pair of darkish glands at the base of the blade, stamens 6, borne from about the middle of the claw. Capsule ovoid, 3-lobed, furrowed between the rounded backs, 1.3–1.8 cm high. Seeds several in each of the 3 carpels, whitish, narrowly obovate, flat, 5–7 mm long.

Bogs, pine savannas and flatwoods, swales, meadows, thickets and edges of wet woodlands. S. N.Y. to Iowa, generally southward to cen. pen. Fla. and e. and s.e. Tex.

9. Veratrum

Veratrum viride Ait. WHITE HELLEBORE, ITCHWEED, INDIAN POKE.

Stout leafy perennial, 6–20 dm tall. Stem pubescent. Leaves 3-ranked, plaited, strongly veined, broadly oval, their bases sheathing the stem (the lower sometimes short-stalked), acuminate or acute apically. Inflorescence a large pyramidal panicle, the axes pubescent, the lower branches with leafy bracts. Perianth yellowish green, moderately spreading, the segments not clawed, glandless, 1–1.5 cm long, 3–5 mm wide, elliptic to oblanceolate, ciliate-serrulate marginally. Stamens attached to the very base of the perianth segments. Capsule ovoid, glabrous, many-seeded, 1.8–2.5 cm long, subtended by the withered perianth.

Wet woodlands, swamps, bogs. Que. to Ont. and Minn., southward in the mts. to N.C., Tenn., Ga.

10. Narthecium

Narthecium americanum Ker. BOG ASPHODEL.

Perennial herb with stout rhizome. Leaves close-set near the base, equitant, erect, narrowly linear, 1–2 dm long, 1–3 mm wide. Flowering stem (scape) with a few bracteal leaves, the inflorescence a terminal bracteate raceme 3–6 cm long. Flowers bisexual. Perianth segments 6, linear-lanceolate, 4–6 mm long, separate, yellowish. Stamens 6, ½ as long as the perianth, filaments pubescent. Ovary 3-locular, gradually tapering into the style. Capsule elongate, loculicidal. Seeds fusiform, tailed at either end, the body 1 mm long or a little more. (*Abama americana* (Ker) Morong; incl. *A. montana* Small)

Bogs. Pine barrens of N.J.; Del., N.C., S.C. Rare.

11. Tofieldia (FALSE ASPHODELS)

Perennial herbs with short rhizomes, the stems leafy only at or near the base, the flowering stem scapose, usually bearing a bracteal leaf at or near the middle. Leaves equitant, linear. Inflorescence a terminal spike, raceme, or thyrse (a cylindrical panicle of short cymes in this case). Flowers bisexual. Perianth segments separate, creamy white or white, spreading or ascending, sessile, not bearing glands, 3 minute bracts just below. Stamens 6. Ovary superior, 3-locular, styles 3, short, subulate. Fruit a septicidal capsule, many-seeded, subtended by the persistent perianth segments, tipped by enlarged divergent styles.

1. Scape, inflorescence axis, and flower stalks glandular-scabrous.

2. Capsule equalling or somewhat shorter than the persistent perianth; seeds with tails ½ or less as long as the body. 1. *T. racemosa*
2. Capsule somewhat longer than the persistent perianth segments; seeds with long slender, usually contorted tails, or one tail at least. 2. *T. glutinosa*
1. Scape, inflorescence axis and flower stalks glabrous. 3. *T. glabra*

1. Tofieldia racemosa (Walt.) BSP. Fig. 345

Basal leaves erect, linear, variable in length, to 4 dm long and 3–5 mm wide; bracteal leaf usually one, inserted somewhat below the middle of the scape. Scape 3–7 dm tall, the scape, inflorescence and flower stalks glandular-scabrous, the inflorescence a raceme or thyrse to 15 cm long, terminal flowers opening first. Perianth segments oblanceolate to oblong, 3-nerved, obtuse, 4–5 mm long. Capsule obovoid, about 3 mm long. Seeds narrowly ellipsoid, about 2 mm long, with tails at each end ½ or less as long as the seed body. (*Triantha racemosa* (Walt.) Small)

Wet sandy-peaty soils, pine savannas and flatwoods, shrub bogs, seepage slopes. Coastal plain, N.J. to n. Fla., w. to s.e. Tex.

2. Tofieldia glutinosa (Michx.) Pers.

Similar to the preceding. Bracteal leaf of the scape sometimes absent. Differing characters as in the key above. (*Triantha glutinosa* (Michx.) Baker)

Calcareous rock ledges, marshes and shores. N.F. to Man., Minn., s. to n. Ohio, to n. Ill., s. in the mts. to Ga.

3. Tofieldia glabra Nutt.

Plant glabrous throughout. Inflorescence racemose. Perianth segments elliptic-oblong, 2.5–3.5 mm long, about equalling the capsule. Seeds minutely tailed or without tails.

Pine savannas and flatwoods, shrub bogs. Coastal plain, N.C. to Ga.

12. Pleea

Pleea tenuifolia Michx. RUSH-FEATHERLING.

Herb perennating by short thickish rhizomes, forming clumps. Leaves close-set basally, their bases broadly scalelike thus giving a bulblike appearance, a pair of narrow tonguelike auricles at the summit of the scale and at the base of the blade; blades linear-attenuate, to 3.5 dm long and 2–4 mm wide, stiff and leathery, evergreen. Scape with 2–4 narrow widely separated bracteal leaves, terminated by a bracteate raceme, 3–8 dm tall; flowers short-stalked, the stalks surrounded below by a bract tubular below, auriculate apically, a nearly terete point extending from between the auricles. Flowers radially symmetrical, bisexual. Perianth segments separate, spreading, lanceolate, 10–15 mm long, white at anthesis, becoming brown and persisting on the fruit. Stamens ½ - ⅔ the length of the perianth. Styles 3, linear, stigmatic at the summit. Capsule 3-locular, ovoid to ellipsoid, 7–9 mm long. Seeds rust-reddish, the body oblique-ellipsoid, 2 mm long or a little more, with linear-attenuate whitish tails extending from either end.

Seepage slopes, *Hypericum* bogs, wet flatwoods depressions, shrub bogs. Coastal plain, s.e. N.C. to Fla. Panhandle and s. Ala.

13. Chamaelirium

Chamaelirium luteum (L.) Gray. DEVIL'S-BIT, RATTLESNAKE-ROOT, BLAZING STAR.

Glabrous perennial with an erect simple stem from a thickish rhizome. Stems variable in height, to 12 dm. Larger leaves close-set at the base of the stem, more or less forming a rosette, the blades elliptic to spatulate or spatulate-obovate, gradually tapering to the petiole, variable in size, 5–20 cm long, 1.5–6 cm wide; stem leaves much smaller, sessile, gradually reduced upward, the topmost somewhat below the inflorescence. Inflorescence an elongate, narrow, flexuous, nonbracteate raceme (sometimes flowers not stalked), staminate and pistillate flowers on separate plants, the staminate spikes more showy than the pistillate. Staminate flowers with separate, white, oblanceolate perianth segments 3–4 mm long. Stamens 6, the filaments of unequal length, from shorter than to exceeding the perianth, flattish, somewhat dilated upward, anthers roundish-oval, about 0.5 mm long. Pistillate flowers fewer per inflorescence, perianth segments white or greenish, narrowly oblanceolate, 2–3 mm long. Rudimentary stamens present. Stigmas 3, linear-clavate, sessile, stigmatic on the inner side. Capsule ellipsoid to obovoid, 7–14 mm long, 3-locular. Seeds reddish brown, ellipsoid, 5–6 mm long, with membranous tails at either end. Staminate flowers become yellow upon drying, the pistillate usually green. (Incl. *C. obovale* Small)

Usually in rich woodlands, wooded slopes, coves, sometimes in dry open woods and meadows; in the southernmost part of the range sporadic in seasonally wet pine savannas and flatwoods. Mass. to s. Ont. and Mich. southward to Fla. Panhandle, Miss. and Ark.

14. Helonias

Helonias bullata L. SWAMP-PINK.

Glabrous perennial herb with a short stout rhizome. Leaves close-set at the base, essentially in a rosette, evergreen, flat, broadly oblanceolate or broadly spatulate, narrowed below to broad petioles. Scape produced in spring, stout, hollow, 3–6 dm tall, with several broad bracts near the base, several remote much smaller bracts to about the middle of the scape; inflorescence a terminal, bractless, dense raceme 3–8 cm long. Perianth segments 6, pink to lilac, separate or very nearly so, spatulate-oblong, 5–9 mm long, glandless, shorter than the filaments, persistent on the fruit. Capsule 3-lobed, 3-locular, dehiscing loculicidally, many-seeded, broader than long. Seeds linear, about 5 mm long, appendaged at both ends.

Swamps and bogs. Coastal plain, s.e. N.Y. to e. Va., mts. of Va., Tenn. and Ga.

15. Schoenolirion (SUNNYBELLS)

Perennial, glabrous herbs with a somewhat bulbous base, the leaves elongate, linear, close-set basally. Inflorescence slenderly scapose, racemose or of panicled racemes, bracteate. Perianth segments 6, united at the very base, the lobes oblong or nearly so, spreading. Stamens 6, not exceeding the perianth segments. Capsule globularly 3-lobed, each lobe bearing 1 nearly round seed within.

- Perianth yellow; flowers in racemes. 1. *S. croceum*
- Perianth white or creamy white; inflorescence usually with 2–several relatively distant branches floriferous only at their summits. 2. *S. elliottii*

1. Schoenolirion croceum (Michx.) Gray. Fig. 346

Leaves with broad subsheathing bases, the blades elongate, flat, 2–8 mm wide. Inflorescence a terminal raceme, the flower stalks subtended by small hyaline bracts. Perianth segments yellow, 5–7 mm long, medially darker yellow, the sides thinner and paler. Seed lustrous black. (*Oxytria crocea* Gray)

Wet pine savannas and flatwoods, boggy seepage areas, wet pockets on rock outcrops. N.C. and Tenn., s. to n. Fla., and s.e. Tex.

2. Schoenolirion elliottii Gray.

Similar to the preceding in general features. Most specimens in a population have the inflorescence with 2–several slender branches floriferous near their summits. Perianth segments white or creamy white, 5–6 mm long. (*Schoenolirion albiflorum* (Raf.) Gates; *Oxytria albiflora* (Raf.) Pollard)

Cypress and cypress-gum ponds, cypress prairies, *Hypericum* ponds, wet flatwoods. Ga., Fla., Ala.

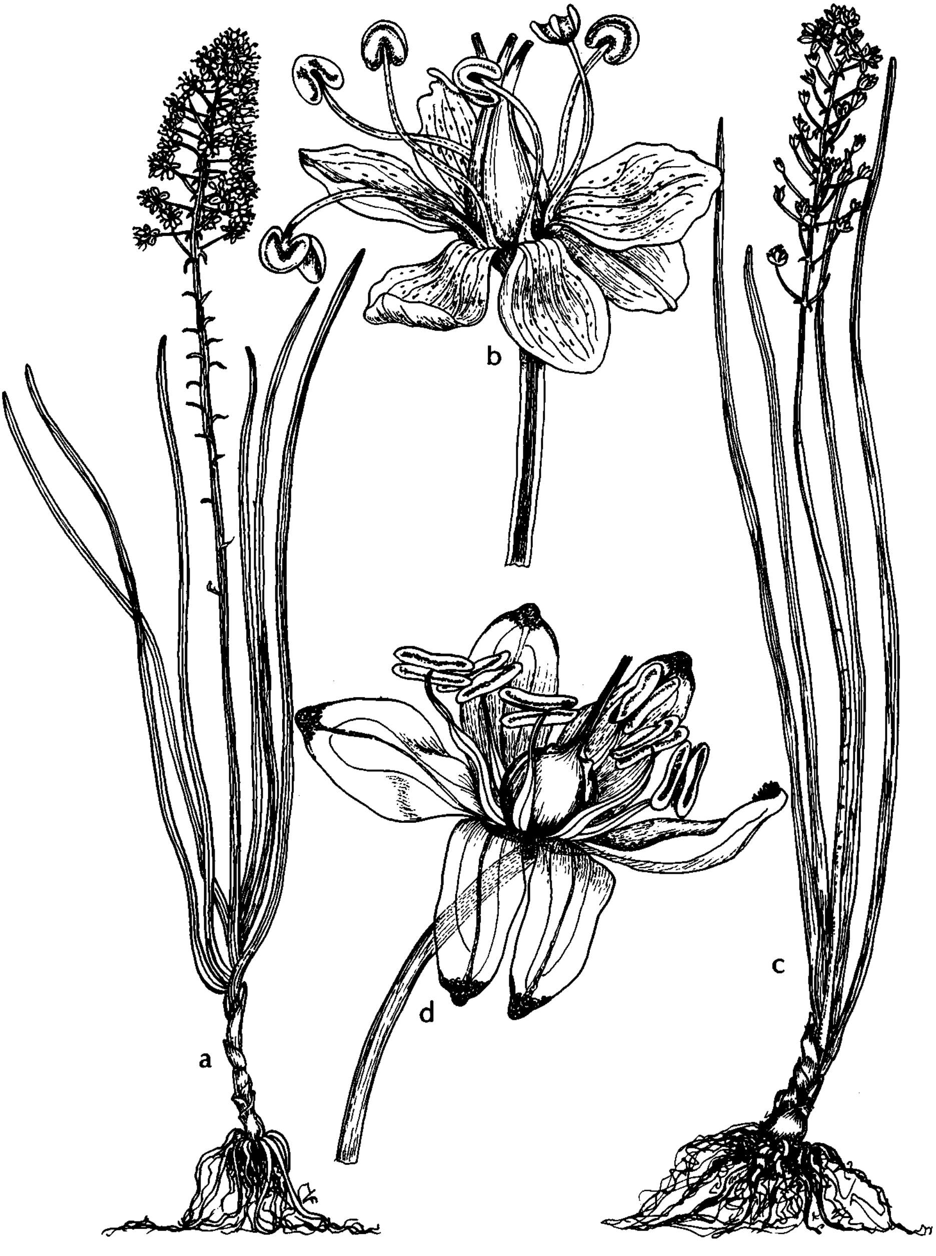


Fig. 346. a–b, **Zigadenus densus:** a, habit; b, flower; c–d, **Schoenolirion croceum:** c, habit; d, flower. (From Correll and Correll)

16. Amianthium

Amianthium muscaetoxicum (Walt.) Gray. FLY-POISON.

Plant with a thick bulb. Leaves close-set basally, elongate-linear, 4–10 dm long and to 2.6 cm wide. Scape 3–10 dm tall, bearing a terminal bracted raceme, at first conic, later ovoid, then cylindric, 3–12 cm long and to about 3 cm across. Flower stalks 8–15 mm long. Flowers bisexual, radially symmetrical. Perianth segments separate, not clawed, glandless, white, 5–7 mm long, oblong-obovate. Ovary deeply 3-lobed, with 3 persistent styles. Capsule 3-locular, 5–7 mm long, subtended by greenish persistent perianth segments. (*Chrosperma muscaetoxicum* (Walt.) Kuntze)

Pine savannas and flatwoods, bogs, meadows, mesic hardwood forests. S. N.Y., Pa., Va., W.Va. to Mo. and Okla., s. to the Fla. Panhandle, Miss., and Ark.

Amaryllidaceae (AMARYLLIS FAMILY)

1. Filaments not connected, free.
  2. Flowers solitary terminating a scape.
    3. Anthers attached on the back about ⅓ the length above the base, filaments about 4–8 mm long. 1. *Cooperia*
    3. Anthers attached medially on the back, filaments elongate. 2. *Zephyranthes*
  2. Flowers in an umbel terminating the scape. 3. *Crinum*
1. Filaments basally attached to or connected by a membranous but conspicuous cup or corona, then extending free beyond the corona. 4. *Hymenocallis*

1. Cooperia

Cooperia drummondii Herb. CEBOLLETA, RAIN-LILY. Fig. 347

Perennial herb with a subglobose tunicated bulb 2–3 cm across, the tunics black. Leaves 2–5, overlapping sheaths forming a "stalk" 2–9 cm long, blades linear, grayish green, usually somewhat glaucous, erect or declining, to 3 dm long. Flower solitary terminating a scape 1–3 dm tall or a little more, subtended by a spathe about 4 cm long, spathe split or looped apically, its tube greenish and about 11 cm long, often fading red. Perianth white above, pinkish below, ovary inferior, the floral tube long-cylindrical, 8–18 cm long, surmounted by a 6-segmented perianth, the segments spreading flat above, the inner 3 slightly smaller than the outer. Stamens 5, filaments 4–8 mm long, anthers cream yellow, 9 mm long, attached on the back ⅓ of the length above the base. Style white, shorter than the stamens or longer. Capsule 3-locular. Seeds black, D-shaped.

In low, seasonally wet, open areas, swales, depressions, saline flats. Northern Mex. to Kan., N.Mex., Tex. and La.

2. Zephyranthes

(ZEPHYR-LILIES, FAIRY-LILIES, ATAMASCO-LILIES, RAIN-LILIES)

Glabrous perennial herbs with tunicated bulbs. Leaves with overlapping sheathing bases, the blades elongate-linear. Flowers borne singly and terminally on a scape, subtended by a spathaceous bract, the latter tubular and enveloping the bud, splitting at anthesis for about ½ its length, 2-cleft apically. Flower radially symmetrical, ovary inferior. Perianth tubular below, 6-segmented above, the 2 series of 3 segments each nearly alike, all petallike. Stamens 6, inserted on the throat of the perianth, the anthers attached medially on the back. Stigmas 3. Capsule 3-lobed, 3-locular, bearing numerous, black, lustrous, flat, D-shaped seeds in each locule.

1. Perianth segments spreading at full anthesis; style and stigmas extending somewhat beyond the anthers.
  2. Leaves (pressed-dried) 2.5–4.5 mm wide, mostly 3–4 mm, concave but not sulcate when fresh, drying flat. 1. *Z. atamasco*
  2. Leaves (pressed-dried) 1–2 mm wide, sulcate when fresh, tending to dry somewhat wrinkled. 2. *Z. treatiae*
1. Perianth segments erect at full anthesis (only narrowly open at the summit); stigma at level of anthers or somewhat below them. 3. *Z. simpsonii*

1. Zephyranthes atamasco (L.) Herb.

Plants clumped, the clumps often large. Leaves 1.5–4.5 dm long, mostly 4 mm wide or more when fresh (2.5–4.5 mm wide pressed-dried), concave, the edges sharp, drying flat. Scape 1–3 dm tall. Perianth segments spreading, somewhat arched-reflexed, mostly white at full anthesis, sometimes pink-tinged, usually becoming purplish pink veined or more or less suffused with purplish pink as they fade, mostly 5–8 cm long, oblanceolate, usually abruptly short-pointed apically, sometimes obtuse or rounded. (*Atamasco atamasco* (L.) Greene)

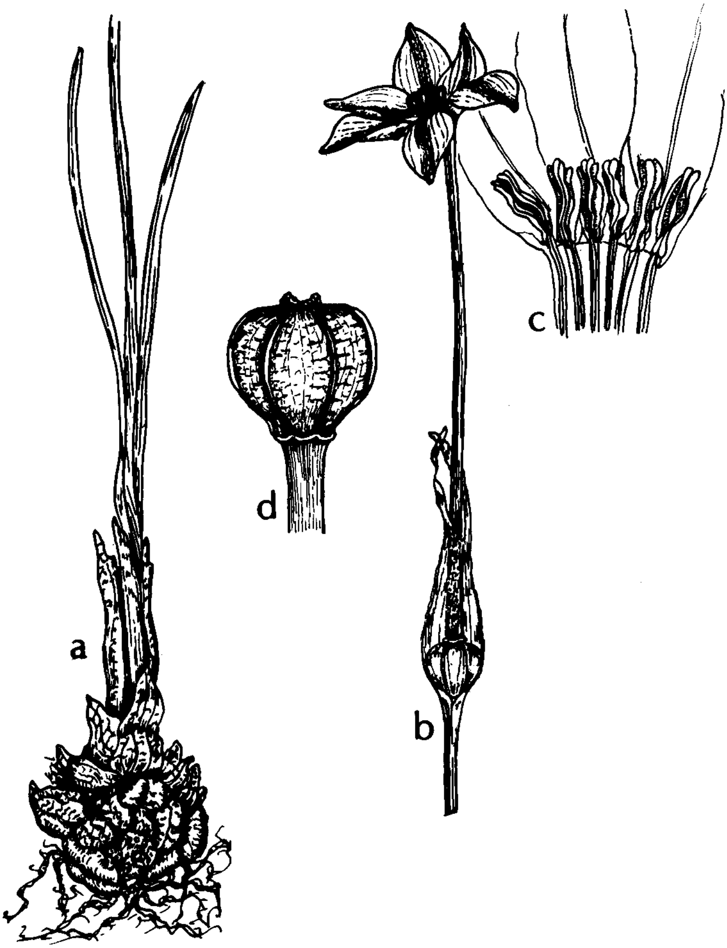


Fig. 347. **Cooperia drummondii:** a, bulb and basal portion of plant; b, upper portion of plant; c, portion of inner perianth with stamens; d, capsule. (From Correll and Correll)

Rich mixed forests, moist clearings and meadows, moist to wet pastures, sometimes abundant in thin rich soil on limestone ledges and outcrops within forests. Coastal plain and piedmont, Va. to n. Fla., w. to Miss.

2. **Zephyranthes treatiae** S. Wats.

Plants usually single, sometimes a few together or loosely clumped. Leaves mostly 1–3 dm long, 3 mm wide or less when fresh (1–2 mm when pressed-dried), sulcate, the edges rounded, tending to dry wrinkled. Scapes mostly 1–2 dm tall. Perianth segments spreading, somewhat arched-reflexed, mostly white at full anthesis, sometimes pinkish, becoming purplish pink veined or suffused with purplish pink as they fade, mostly 5–8 cm long, oblanceolate, often acuminate or acute apically, sometimes abruptly pointed, obtuse or rounded. (*Atamasco treatiae* (S. Wats.) Greene)

Wet pine flatwoods, where showing very much greater abundance the spring following a fire than at other times; indeed, between fires they may show some leaves but not bloom at all, or only a very few plants bloom; now common on roadside mowed sods adjacent to flatwoods, there most plants bloom each year; also occurring similarly in permanent pastures established on former flatwoods sites. Coastal plain, s. Ga. to cen. pen. Fla., w. in n. Fla. to Gadsden Co.

3. **Zephyranthes simpsonii** Chapm.

Plants solitary or somewhat clumped. Leaves 1–2 dm long, (? about 2 mm wide when fresh), 1–1.5 mm wide pressed-dried, sulcate, the edges rounded, tending to dry wrinkled. Scapes mostly 1–2 dm tall. Perianth segments white tinged with pink or purple, they (and especially the spathes) becoming purple as they fade, oblanceolate to narrowly obovate, 3–6 cm long, abruptly short-pointed apically, or acute to acuminate, sometimes obtuse or rounded. (*Atamasco simpsonii* (Chapm.) Greene)

Wet pinelands, pastures established on former pineland sites, adjacent mowed roadside sods. Cen. and s. pen. Fla. If of rare and local occurrence elsewhere in our range probably persisting after or naturalized from cultivation.

3. Crinum

Crinum americanum L. SWAMP-LILY, STRING-LILY. Fig. 348

Perennial herb with succulent tunicated bulb. Leaf bases arise alternately and sheath each other for some distance thus forming a stalklike portion above the bulb proper, leaves then ascending-spreading alternately above; blades gradually become flattened and broadly straplike from the rounded sheathing base, to 10–15 dm long and 6–7 cm wide; upper leaf surface smooth, the lower smooth or ribbed, margins entire or with small and conspicuous, remote, and irregularly spaced soft teeth; internally with conspicuous septate aerenchymatous chambers longitudinally paralleling throughout the length of the leaf. Scape nearly equalling the leaves in length, arising laterally from the bulb, terete or oval in cross-section, terminated by an umbel of 2–6, usually 4, flowers, the umbel subtended by 2 primary spathaceous, membranous bracts which at anthesis spread opposite each other, their bases broad then tapering gradually to a long tapering tip, a long, narrowly attenuate, membranous bract subtending each flower. Flowers delicately fragrant, white or white streaked with pink. Floral tube long, slender and greenish, extending 10–15 cm beyond the summit of the ovary, perianth segments 6, oblanceolate, 7–14 cm long, at first ascending, then spreading abruptly in a salviform fashion, finally arching-reflexed. Stamens 6, filaments purplish pink, each arising from the base of a perianth segment and about ⅔ as long as the segment; anther linear, attached at its center and spreading horizontally, opening by ventral slits. Style slender, purplish pink, somewhat shorter than the filaments and with a very small stigmatic surface terminally. Ovary 3-locular, each locule bearing 1–several ovules one above the other. Fruit a thin-walled capsule bearing 1–several large fleshy seeds. As the capsule matures the scape is bent over from its own weight bringing the capsule to lie upon the

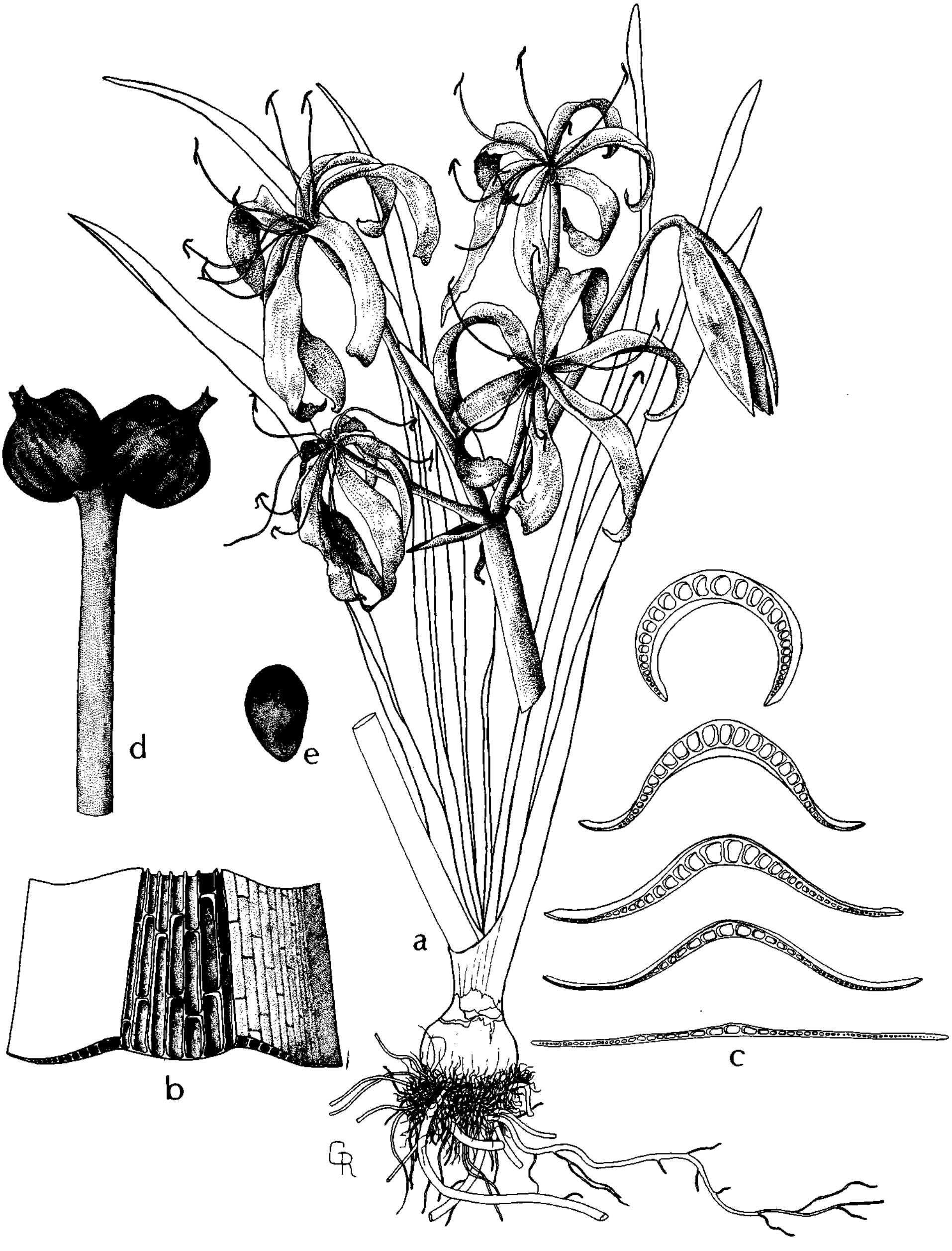


Fig. 348. **Crinum americanum:** a, habit; b, section of leaf; c, diagrammatic cross sections of leaf at different levels (base upper, to upper midsection lower diagram); d, capsules; e, seed.

ground. Germination of the seeds commonly commences within the capsule, their enlargement causing irregular rupturing of the wall of the fruit.

Swamps, marshes, stream shores. Coastal plain, Ga. and Fla., w. to s.e. and s. coastal Tex.

4. Hymenocallis (SPIDER-LILY) Fig. 349

Herbs with straplike leaves from a rather large tunicated bulb. Flowers erect, essentially sessile, terminating a scape arising centrally, the flower or flower cluster (umbel) subtended by 2–4 membranous bracts; flower with an elongate floral tube, the ovary seated within it at the base, floral tube surmounted by 6 narrow, white (in ours) perianth segments; within the perianth a conspicuous, white, thin-membranous, flaring cup (corona) connecting the lower portions of the 6 filaments, upper portions of the filaments free. Style, beyond the floral tube, slender, stigma capitate. Capsule fleshy, seeds 1–6 in each of the 3 locules.

There is a relative paucity of herbarium material of *Hymenocallis* and this is largely of poor quality. There is an equal dearth of critical information in the published record about attributes of plants in the wild on a population basis. Our own experience with spider-lilies as they occur in our range is negligible and we have been unable satisfactorily to put together concepts of taxa from herbarium specimens together with use of the following relatively recent publications: (1) C. V. Morton, "A Check List of the Bulbous Amaryllidaceae Native to the United States," *Yearbook Amer. Amaryllis Soc.* 2:80–83. 1935; (2) J. Robert Sealy, "Review of the Genus *Hymenocallis*," *Kew Bulletin* 9:201–240. 1954; (3) Hamilton P. Traub, "Key to the Subgenera, Alliances and Species of *Hymenocallis, Plant Life* (*The Amaryllis Yearbook*) 18:55–72. 1962. Reluctantly, therefore, we can offer no treatment for the genus *Hymenocallis.*

In our range, spider-lilies occur for the most part (although not exclusively) in wetlands, sometimes in great abundance, not uncommonly in water, swamps, floodplain forests, wet woodlands, sloughs, streams, ditches, meadows, and other wet places.

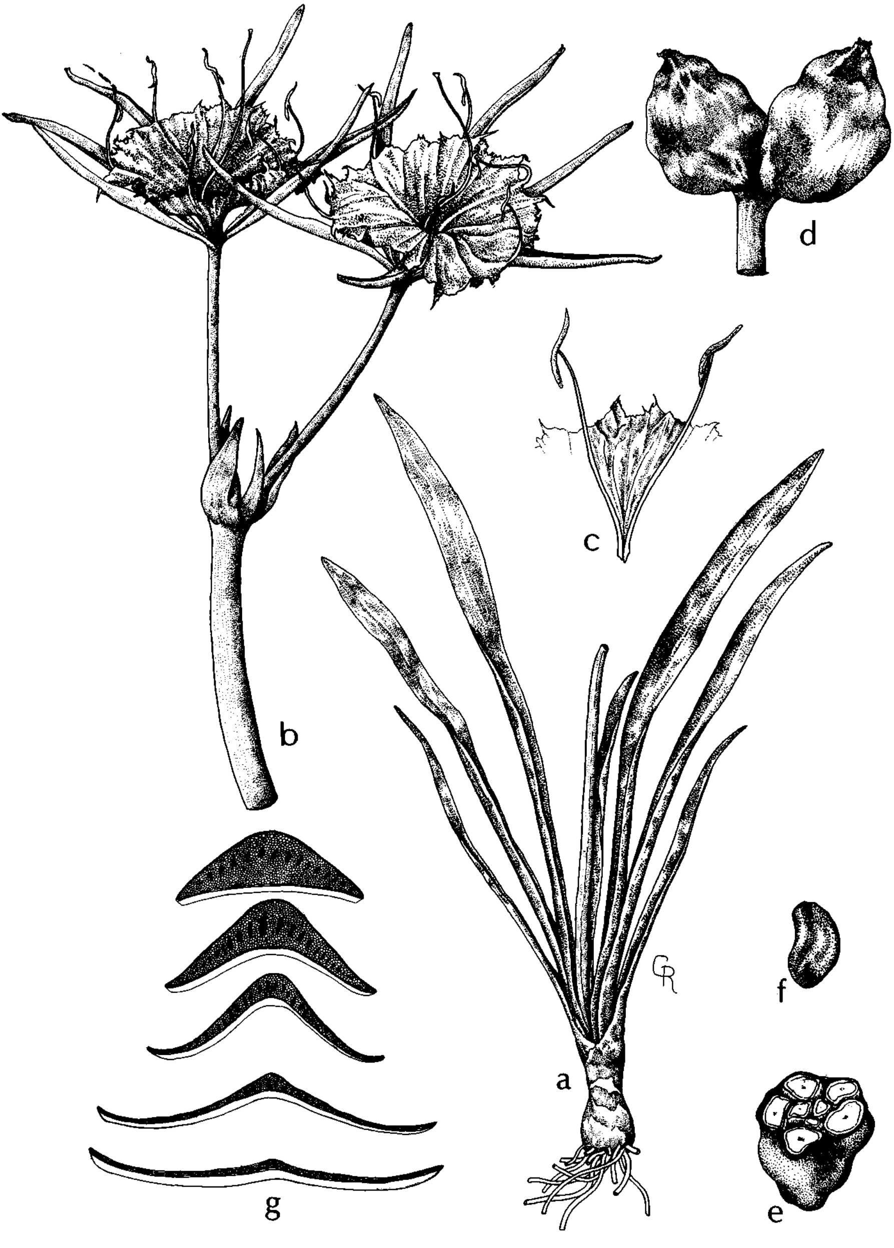


Fig. 349. **Hymenocallis sp.**: a, habit (inflorescence removed); b, inflorescence; c, portion of corona with stamens; d, capsules; e, cross-section of capsule; f, seed; g, sections of leaf at different levels (from top to bottom: from base of leaf to about midleaf).

Hypoxidaceae

Hypoxis (YELLOW STAR-GRASSES)

Perennial herbs with vertical corms, the leaves mostly linear, their midribs commonly off-center, closely set basally. Flowers borne terminally on a scape, solitary or in a 2–several-flowered irregular umbel. Ovary inferior, the perianth segments 6, 3 in each of 2 series, surmounting the pilose floral tube, those of the 2 series nearly alike, spreading at anthesis, yellow to yellowish white on the upper surface, greenish below; after anthesis becoming erect, green, and converging above the developing fruit. Stamens 6, about ½ as long as the perianth lobes. Ovary 3-locular, ovules numerous. Fruit an indehiscent or a loculicidal capsule. Seeds with pebbled or muricate surfaces, or otherwise sculptured surficially.

Perianth segments at anthesis vary considerably from plant to plant in a population, both in size and shape; in addition they change in size, and shape, besides becoming erect, after anthesis. Thus it is difficult, if not impossible, for a given taxon to describe the perianth in a meaningful way without a great deal of equivocation.

For purposes of identifying specimens of *Hypoxis,* it is important to have carefully extracted the bases of the plant from the substratum. It is essential, too, to have fully developed capsules and mature seeds. The latter have, for the most part, distinctive surface features though considerable magnification is required to observe them effectively.

1. Seeds black.
2. Seeds muricate, the murications pointed.
3. Leaves at base of plant with bladeless sheaths; fruit little longer than broad; murications of the seed narrowly angled and sharp-pointed. 1. *H. hirsuta*
3. Leaves at base of plant all with blades; fruit much longer than broad; murications of the seed broadly angled and relatively blunt-pointed. 2. *H. leptocarpa*
2. Seeds with rounded-pebbled surface.
4. Base of plant, above the corm and below the substratum with dark brown membranous disintegrating leaf bases; leaves filiform, 0.4–0.8 mm wide, mostly U-shaped in cross-section. 3. *H. juncea*
4. Base of plant, above the corm and below the substratum densely bristly-fibrous; leaves stiff, 0.8–1.5 mm wide, not U-shaped in cross-section. 4. *H. rigida*
1. Seeds dark brown or iridescent.
5. Seeds muricate, the murications fine and dense, each very finely pointed, dark brown. 5. *H. micrantha*
5. Seeds reticulate-pitted, the pits iridescent. 6. *H. sessilis*

1. **Hypoxis hirsuta** (L.) Coville.

Base of plant, above the corm and below the substrate, clothed with membranous pale to brown bladeless sheaths. Leaf blades linear, firm, mostly ascending-erect, 5–60 cm long, 1–8 mm wide, pilose. Flowers 2–9 in an irregular umbel terminating the usually erect scape, scape pilose, 4–20 cm long. Outer perianth segments pilose below, the inner usually pilose only medially below, outer somewhat longer than the inner, variable in size and shape, lanceolate to elliptic, acute to obtuse, 5–15 mm long. Fruit oval to obovate, mostly 3–5 mm long, little longer than broad. Seeds black, muricate, the murications narrowly angled and sharp-pointed.

Open woodlands, meadows, pastures, savannas, usually on well-drained sites. S.w. Maine, s. N.H. to Man. and N.Dak., generally southward to Ga. and e. Tex.

2. **Hypoxis leptocarpa** (Engelm. & Gray) Small.

Base of plant, above the corm and below the substrate with pale, membranous, sheathing bases of bladed leaves. Leaf blades elongate, usually widest near the middle, tapering both below and above, variable in length and width, the larger commonly 4–5 dm long, sometimes longer, 8–12 mm wide near the middle, commonly wholly glabrous, sometimes very sparsely pilose, thin and flaccid, usually arched or simply lying on the substrate. Plants in wet muck usually with much larger and more flaccid leaves than those on somewhat higher ground. Flowers solitary or 2–several in irregular umbels, the scapes often glabrous below, pilose near the summit, sometimes pilose throughout. Outer perianth segments usually somewhat pubescent below, a little longer than the inner, 5–7 mm long and elliptic at anthesis, usually 8–10 mm long on the fruit and broadest at the base, tapering gradually to the summit. Fruit nearly oblong, 5–10 mm long, usually much longer than broad. Seeds black, muricate, the murications broadly angled and blunt-pointed.

Usually in heavy, wet mucky soil, swamps, floodplain forests, wet woodlands. Coastal plain, N.C. to cen. pen. Fla., w. to s.e. Tex.

3. **Hypoxis juncea** J. E. Sm.

Base of plant, above the corm but below the substratum, with dark brown, partially decomposed membranous leaf bases, these occasionally becoming bristly-fibrous. Leaves filiform, 0.4–0.8 mm wide, nearly U-shaped in cross-section, the longer 1–3 dm long or a little more, pilose. Flowers solitary on the scapes or 2–3 on stalks of unequal length terminating the scape. Scapes 4–18 cm long, pilose, shorter than to about equalling the longer leaves. Perianth segments 8–12 mm long, lanceolate to narrowly deltoid, usually acute or acuminate apically, sometimes obtuse, tending to become involute distally with age. Fruit oval to obovate in outline, 5–8 mm long. Seed lustrous black, its surface rounded-pebbled.

Pine savannas and flatwoods, boggy pond pine flats, moist to wet sandy-peaty ditches and banks. Coastal plain, N.C. to Fla.

4. **Hypoxis rigida** Chapm.

Corm and base of the plant below the substratum densely covered with old leaf bases disintegrated to bristly fibers. Leaves stiff and rigid, margins involute, pilose, 0.8–1.5 mm wide, 1–3 dm long (early season leaves much shorter). Flowers solitary or 2–3 with unequal stalks terminating the scape. Scapes 5–20 cm long, pilose at least above, shorter than to equalling the leaves. Fruit oval to narrowly obovate, mostly 3–5 mm long. Seeds lustrous black, the surface rounded-pebbled.

Pine savannas and flatwoods, bogs, adjacent ditches and banks, sandy prairies. Coastal plain, s.e. N.C. to n. Fla., w. to s.e. Tex.

5. **Hypoxis micrantha** Pollard in Small.

Base of plant, above the corm but below the substratum, with dark brown membranous partially decomposed leaf bases, these sometimes disintegrating into bristly fibers. Leaves narrowly linear, from about 0.5–2.5 mm wide, more or less involute, variable in length, the longer mostly 1–2 dm long, sometimes longer, pilose. Flowers usually solitary, the scapes 1–10 cm long, pilose, mostly much exceeded by the longer leaves. Perianth segments variable, 4–8 mm long, those of both series lanceolate and nearly alike, sometimes the outer longer than the inner and lanceolate, the inner elliptic, their apices mostly acute or acuminate, sometimes rounded, distal portions tending to be involute after anthesis. Fruit oval in outline, 5–6 mm long. Seeds dark brown, their surfaces very densely covered with short, sharp-pointed murications.

Pine savannas and flatwoods, adjacent ditches and banks. Coastal plain, Va. to Fla., w. to n.e. Tex.; W.I.

6. **Hypoxis sessilis** L.

Base of plant, above the corm but below the substratum, with dark brown membranous partially decomposed leaf bases, these usually not bristly-fibrous. Leaves narrowly linear, the margins usually involute, pilose, the longer 1–2 dm long, 1–2 mm wide.

Flowers usually solitary, the scapes 1–8 cm long, pilose, much exceeded by the longer leaves. Perianth segments linear-lanceolate, becoming involute at least distally on the fruit, tapered to blunt tips, 10–15 mm long on the fruit, usually 8 mm long or less at anthesis. Fruit 4–8 mm long, oval to narrowly obovate in outline. Surface of seed reticulate-pitted, the pits iridescent, coppery gold-green-blue.

Pine savannas and barrens (perhaps only on well-drained sites). Coastal plain, s.e. N.C. to n. Fla., w. to s.e. Tex.

Haemodoraceae (BLOODWORT FAMILY)

- Divisions of the perianth equal; stamens 6; rhizomes white to brown. 1. *Lophiola*
- Perianth with 3 outer divisions shorter than 3 inner divisions; stamens 3; rhizomes red. 2. *Lachnanthes*

1. Lophiola

Lophiola americana (Pursh) Wood. GOLDEN-CREST.

Perennial herb with brown to whitish rhizomes and roots. Stem pubescent from apex nearly to base. Leaves alternate, equitant, linear, tapering gradually to acute tip, mostly glabrous, 2.5–5 mm wide; cauline leaves clasping, reduced upward. Inflorescence a solitary, terminal, bracteate, dichotomous cyme. Flowers bisexual; perianth segments woolly-pubescent, yellow, the 6 stamens included; ovary half-inferior; style 1, stigma capitate. Fruit an ovoid beaked capsule; seeds yellow-white, ellipsoid, rounded at both ends, about 2 mm long. (*L. aurea* Ker.)

Wet ditches, bogs, savannas, pine flatwoods. Coastal plain, N.J.; N.C. to n. Fla. and Miss.

2. Lachnanthes

Lachnanthes caroliniana (Lam.) Dandy. RED-ROOT. Fig. 350

Perennial herb with red rhizomes and roots, these with red juice. Stem pubescent only toward the apex. Leaves alternate, equitant, linear, tapering gradually to acute tips, 5–15 mm wide; cauline leaves clasping, reduced upwards. Inflorescence a solitary, terminal, bracteate, congested cyme. Flowers bisexual; 3 outer perianth segments shorter than 3 inner, woolly-pubescent, yellow, the 3 stamens long exserted; ovary inferior; style one, the stigma capitate. Fruit a globular capsule; seeds brown, flat, rounded at the ends, attached at the middle. (*Gyrotheca tinctoria* (Walt.) Salisb.)

Wet ditches, bogs, swamps, savannahs, pine flatwoods. Coastal plain, N.C. to Fla., w. to La.; cen. Tenn.; Cuba.

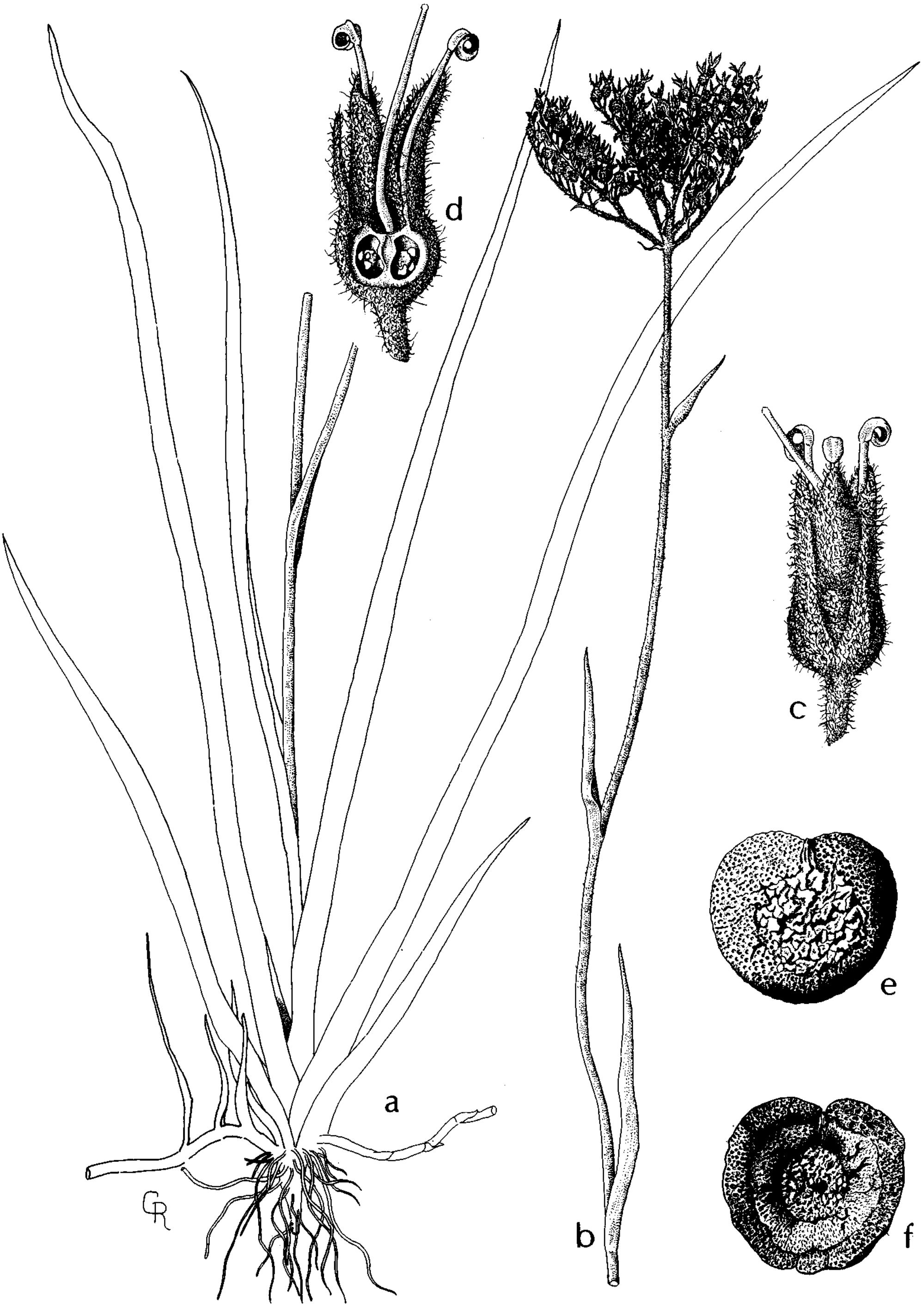


Fig. 350. **Lachnanthes caroliniana:** a, b, base of plant and inflorescence; c, flower; d, flower partially sectioned longitudinally; e, f, seed, opposite surfaces.

Iridaceae (IRIS FAMILY)

- Plants rhizomatous; stems not winged; style branches broad and petallike, the stamens sheltered or hidden beneath them; perianth of 6 clawed segments, the outer 3 spreading or reflexed, the inner 3 erect or arching. 1. *Iris*
- Plants tufted; stems winged; style branches threadlike; perianth segments 6, closely similar, not clawed. 2. *Sisyrinchium*

1. Iris

Rhizomatous perennials with swordlike or linear, acute leaves and large showy flowers. Flowers bisexual, radially symmetrical, subtended by spathaceous bracts. Ovary inferior, the floral tube surmounted by 6 clawed perianth segments, the outer more distinctly clawed than the inner, the inner sometimes scarcely clawed, the sepals spreading or reflexed, the petals erect or arching, (in ours) narrower and shorter than the more showy sepals. Stamens 3, inserted at the base of the sepals. Ovary 3-locular, 3–6-angled or -lobed without; style divided into 3 petallike branches which arch over the stamens, each 2-lobed at the tip, the stigma a thin lip or plate at the base of the 2 lobes. Fruit a capsule bearing numerous seeds in 1 or 2 longitudinal rows in each locule.

1. Flowers yellow or coppery red to bronze.
  2. Flowers bright yellow to golden yellow; sepals and petals not notched at the summit, the sepals much longer than the erect petals. 1. *I. pseudacorus*
  2. Flowers dark red to coppery red or bronze; sepals and petals notched at the summit, nearly equal in length, the petals not erect. 2. *I. fulva*
1. Flowers shades of blue to purple.
  3. Petals little if any longer than the claws of the sepals. 3. *I. tridentata*
  3. Petals $^2/_3$ as long as the entire sepal or longer.
    4. Largest leaves not over 5 mm wide. 4. *I. prismatica*
    4. Largest leaves much over 5 mm wide.
      5. Lowest foliar bract of the inflorescence long, usually reaching or exceeding the topmost flower; inflorescence axis zigzag.
        6. Flowering stem 2–4 dm high, slender, shorter than the lower leaves, the flowers more or less hidden in the leaves. 5. *I. brevicaulis*
        6. Flowering stem (6–) 8–12 dm tall, stout, the lower leaves sometimes reaching the inflorescence or only a little exceeding it, the flowers conspicuously adorning the summit of the plant. 6. *I. hexagona*
      5. Lowest foliar bract of the inflorescence usually not reaching the topmost flower; inflorescence not zigzag. 7. *I. virginica*

1. Iris pseudacorus L. YELLOW-FLAG. Fig. 351

Rhizome stout, 2–3 cm in diameter, pinkish, extensively spreading. Stems 7–12 dm tall, about equalling the leaves. Leaves erect below, arching to nodding distally, 4–8 dm long, 2–3 cm wide. Flowering stem erect, the foliar bract about as long as the inflorescence, usually with one flower in the axil of the foliar bract, two others from the terminal spathes. Sepals arching, 5–8 cm long, with short broad claws, the blades ovate to suborbicular, golden yellow, the claw and centrally the base of the blade flecked with brown. Petals erect, yellow, 2–3 cm long, linear to narrowly fiddle-shaped. Capsule oblong, 5–8 cm long, obscurely 3-angled. Seeds brown, corky, angular.

Native in Eurasia and Africa. Naturalized from cultivation locally in the eastern U.S., mostly in swampy woodlands, marshes, meadows, and along small streams.

2. Iris fulva Ker. RED-FLAG. Fig. 352

Rhizome stout, usually fibrous from old disintegrating leaf bases. Stem 7–10 dm tall, slightly zigzagging. Leaves erect, to about 9 dm long. Foliar bract subtending the

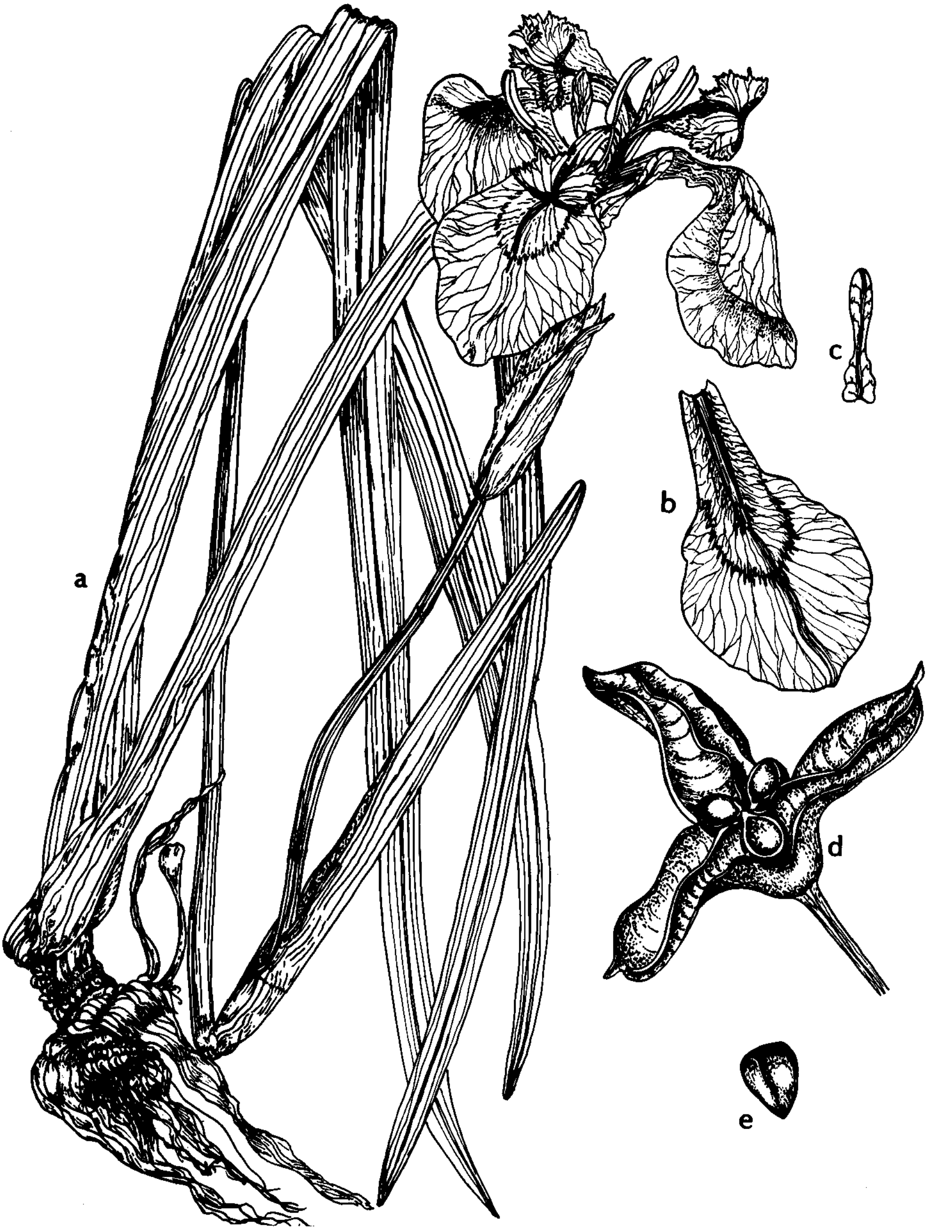


Fig. 351. **Iris pseudacorus:** a, plant; b, outer perianth segment; c, inner perianth segment; d, capsule, open; e, seed. (From Correll and Correll)

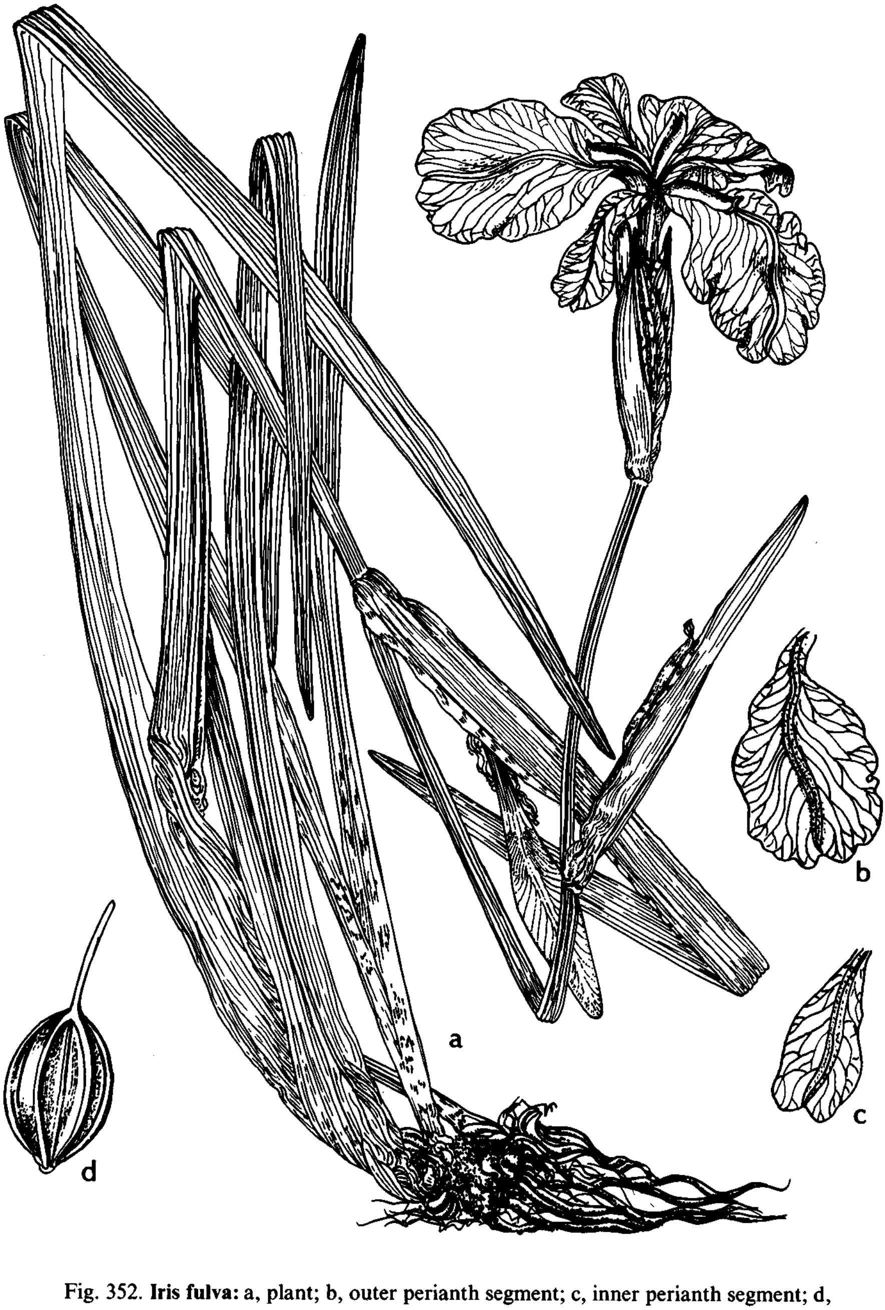


Fig. 352. **Iris fulva:** a, plant; b, outer perianth segment; c, inner perianth segment; d, fruit. (From Correll and Correll)

inflorescence usually much shorter than the inflorescence, commonly a flower in its axil, another from the next spathe above, and 1–several from the terminal spathes. Perianth segments coppery red, dark red to red or bronze (becoming purplish in drying), notched at the summit. Sepals with a short claw, spreading then strongly arching and often descending distally, 4.5–5.5 cm long, the blades oval to obovate. Petals arching or descending, spatulate, oblanceolate, or elliptic-obovate, scarcely clawed, nearly as long as the sepals. Capsule elliptic to oval in outline, 4.5–5.5 cm long, not beaked but sometimes shortly constricted apically.

Swamps, marshes, sloughs. Ga. to La. (e. Tex.?), n. in the interior to Ky. and Mo.

3. **Iris tridentata** Pursh. BAY BLUE-FLAG. Fig. 353

Rhizomes at first relatively slender, about 5 mm in diameter, and clothed with coarse, strongly many-ribbed, brown, overlapping scales; older rhizomes thicker, 1–2 cm in diameter, and more or less covered with short to longish dark brown fibers from old leaf bases. Stems 3–7 dm tall, usually unbranched and bearing a single flower, sometimes once-branched, each branch with a single flower. Leaves glaucous, linear-tapering to a long-acute summit, 3–4 dm long, 5–10 mm wide. Inner spathaceous bract much longer than the outer, reaching to about the middle of the flower, 5–10 mm wide on a side. Sepals arching, drooping distally, their blades ovate or oval, a bit longer than the claw, apically rounded, violet, the base of the blade centrally with a yellow spot flecked or lined with violet, the claw greenish and flecked or lined with violet and bordered with violet. Petals erect, oblanceolate, shorter than to just longer than the claw of the sepal, greenish at the base, violet above with deeper violet lines. Capsule obtusely 3-angled, sometimes scarcely angled at all, short-oblong, truncate to rounded basally, abruptly contracted into a beak at the summit, well-developed capsules 2.5–4 cm long, 2 cm across. Seeds in 2 rows in each locule, corky, semicircular or lunate, about 6 mm across. (*I. tripetala* Walt.)

Seasonally wet pine savannas and flatwoods, borders of cypress-gum ponds, bogs, ditches. Coastal plain, s.e. N.C. to n. Fla.

4. **Iris prismatica** Pursh ex Ker. SLENDER BLUE-FLAG.

Rhizomes slender, to 5 mm in diameter. Stems slender, 3–6 dm tall, overtopping the leaves. Leaves 3–4.5 dm long, narrow, 2–5 mm wide. Foliar bract subtending the inflorescence usually much shorter than the inflorescence, 1 or more flowers from its axil, sometimes one or two bracts above with 1–2 spathes in their axils, 1–3 flowers from the terminal spathes. Sepals 4–5 cm long, arching and the blade descending, distally with a purplish-whitish background and veined with deep purple, somewhat yellowish below, the blade ovate to obovate or suborbicular. Petals erect to arching-erect, clawed, the blades oblanceolate to narrowly obovate, about ⅔ as long as the sepals, purple. Capsule 3–4 cm long, narrowly oblong in outline, sharply 3-angled. Seeds in 1 row in each locule, brown, not or scarcely corky. (Incl. *I. prismatica* var. *austrina* Fern.)

Marshes, meadows, bogs, wet thickets. N.S. to Ga., along the coast, and in the s. Appalachians.

5. **Iris brevicaulis** Raf. LAMANCE IRIS.

Rhizome 1–2.5 cm in diameter. Leaves to 7 dm long, 1.5–3 cm wide, flaccid, conspicuously overtopping the short, zigzag flowering stem, the latter 2–4 dm high. (Leaves said to be prostrate and the flowering stems lying on the ground as well.) Foliar bract subtending the inflorescence much exceeding it, sometimes a flower in its axil, and 1 or more much smaller bracts above subtending spathes and flowers. Perianth deep blue to purple. Sepals 7–9.5 cm long, the blade ovate, arching, 2.5–3 cm broad, a little longer than the claw, base of blade greenish white around the distal portion of a yellow papillose crest extending from the greenish yellow, dark-striped claw. Petals oblanceolate or spatulate, only a little shorter than the sepals, arching and descending distally. Capsule ovoid to oblong, 3–5 cm long, hexagonal. (*I. foliosa* Mack. and Bush)

Swamps, wet woodlands, marshy shores. Ohio to e. Kans., s. to Ala. and e. Tex.

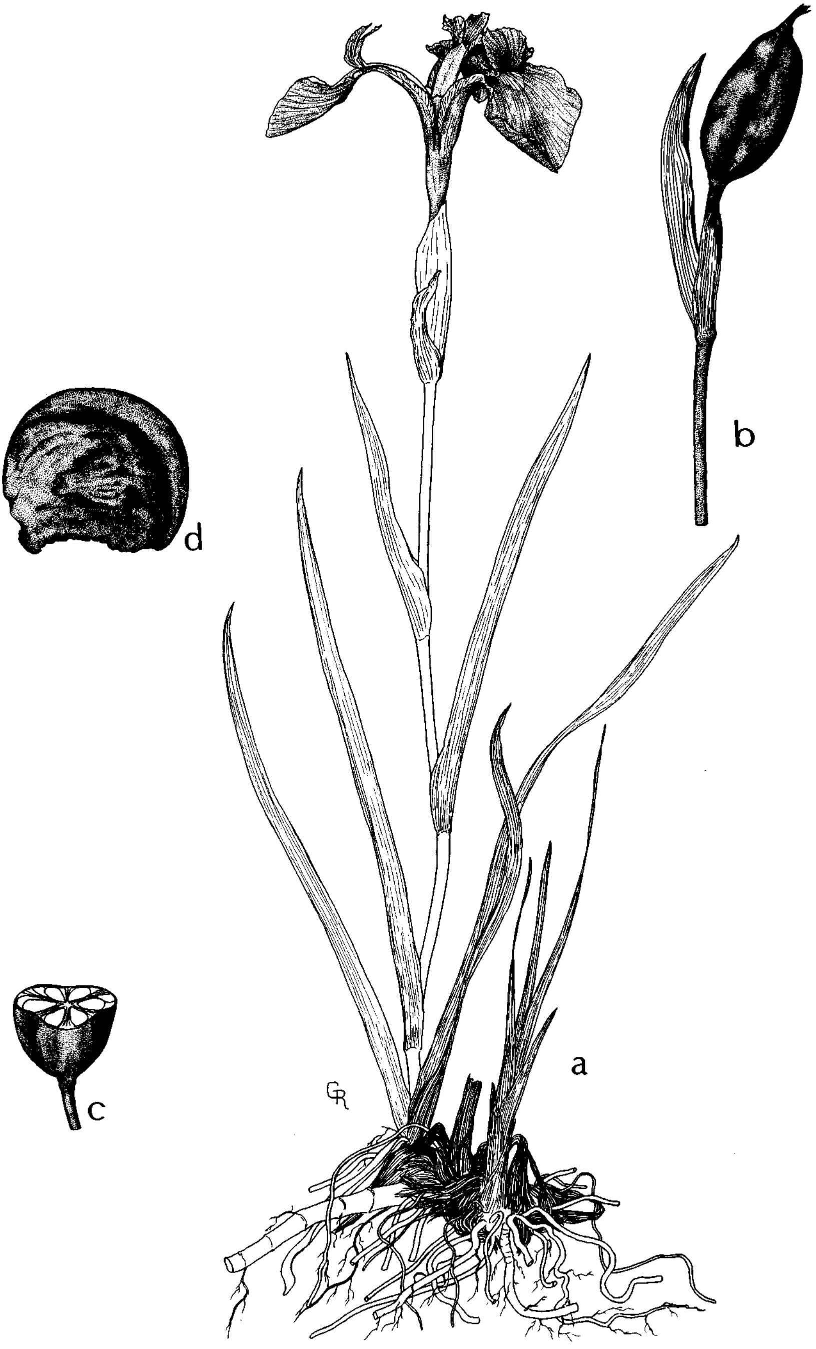


Fig. 353. **Iris tridentata:** a, habit; b, capsule; c, capsule in cross section; d, seed.

6. Iris hexagona Walt. ANGLEPOD BLUE-FLAG. Fig. 354

Rhizomes elongate, 1–2 cm in diameter, bearing numerous fibrous roots but not usually fibrous with old leaf bases. Leaves stiffly erect, several close together, blades green or pale green, glaucous when young, to 7 dm long, sometimes the longer ones reaching or a little exceeding the flowers. Flower stalk erect; sometimes with a flower or flower cluster terminally, more commonly somewhat geniculate, a long foliaceous bract at a node subtending a flower or flower cluster, then a rather long internode, another long foliaceous bract at the node above and subtending a flower or flower cluster, thus usually flowers or flower clusters from 2–4 somewhat geniculate nodes; foliaceous bracts variable in length from plant to plant, the lower if more than one, always longer and more leaflike, as long as 6–7 dm, the uppermost shortest, commonly about 1.5 dm long. Flowers very handsome. Sepals 7.5–9.5 cm long, blades oval, oblong, or ovate, rich purple, claw yellowish green with darker green lines, with a central linear yellow hairy crest distally on the claw and extending onto the base of the blade; either side of the crest, the base of the blade white with purple lines. Petals mostly 7–8 cm long, spatulate, the blade deep purple, the claw yellow-green at the base, centrally yellow with purple lines above and with white- to purple-lined borders. Capsules oval to oblong, 3–4 (–8) cm long, about 2 (–4) cm across, abruptly narrowed at the summit to a short thickish beak; usually, not always, somewhat flattened, with 3 somewhat elevated longitudinal ridges on each of the rounded "edges." Seeds usually in 2 longitudinal rows in each locule, sometimes in 1, corky, irregularly compressed.

We should emphasize that our description of *Iris hexagona* may be too narrowly drawn to include all of its variant forms. Our knowledge is too limited and unsophisticated even to know, in many cases, which of the plethora of species treated by Small (1933) may be identifiable with it or closely allied to it. Indeed, this includes *I. brevicaulis,* here recognized as specifically distinct from *I. hexagona,* but so treated without much conviction.

Swamps, clearings of swamps, drainage ditches and canals, cypress-gum ponds, cypress prairies, wet swales, marshy shores. S.C. to Fla., w. to s.e. Tex., n. to s.e. Mo.

7. Iris virginica L. SOUTHERN BLUE FLAG. Fig. 355

Rhizome stoutish, 1–2 cm in diameter, sometimes more or less covered with brown fibers from old leaf bases. Stems 5–10 dm tall, rather weak, often falling over after flowering. Leaves flexuous, to about 6–8 dm long and to 3 cm wide, the lower portions of lower leaves buff-colored, sometimes suffused with purplish pigment. Flowering stem usually exceeding the leaves, the foliar bract subtending the inflorescence about equalling it. Flowers usually several, one from the axil of the foliar bract, 1–2 from the next spathe above, and 2–3 from the terminal spathe, the axis straight, stalks of the flowers elongating as the fruit matures, becoming 4–7 cm long. Sepals spreading and arched, 7–10 cm long, their blades obovate to oval, pale blue to purple, with darker blue or purple venation, the claw green medially, broadly bordered by a yellow ground color with blue or purple lines, the yellow extending centrally on to the base of the blade. Petals ascending, spatulate to obovate, ⅔ as long as the sepals or a little more, the claws greenish yellow with blue or purple lines. Capsule 3–6 cm long, 1–2 cm wide, usually oblong, obscurely angled. Seeds pale brown, corky, very variable in shape. (*I. caroliniana* S. Wats.)

Commonly in shallow water, marshes, marshy shores, swamps, sloughs, drainage ditches and canals, low wet areas in pine savannas and flatwoods. S.e. Va. to Fla., w. to e. Tex. and e. Okla.

2. Sisyrinchium (BLUEEYED-GRASSES)

Perennial or annual usually tufted herbs, the herbage grasslike. Leaves equitant, narrowly linear, mostly basal. Stems (scapes), 2-edged or 2-winged, from the axil of a leaflike bract. Flowers bisexual, mostly radially symmetrical, in umbelllike clusters

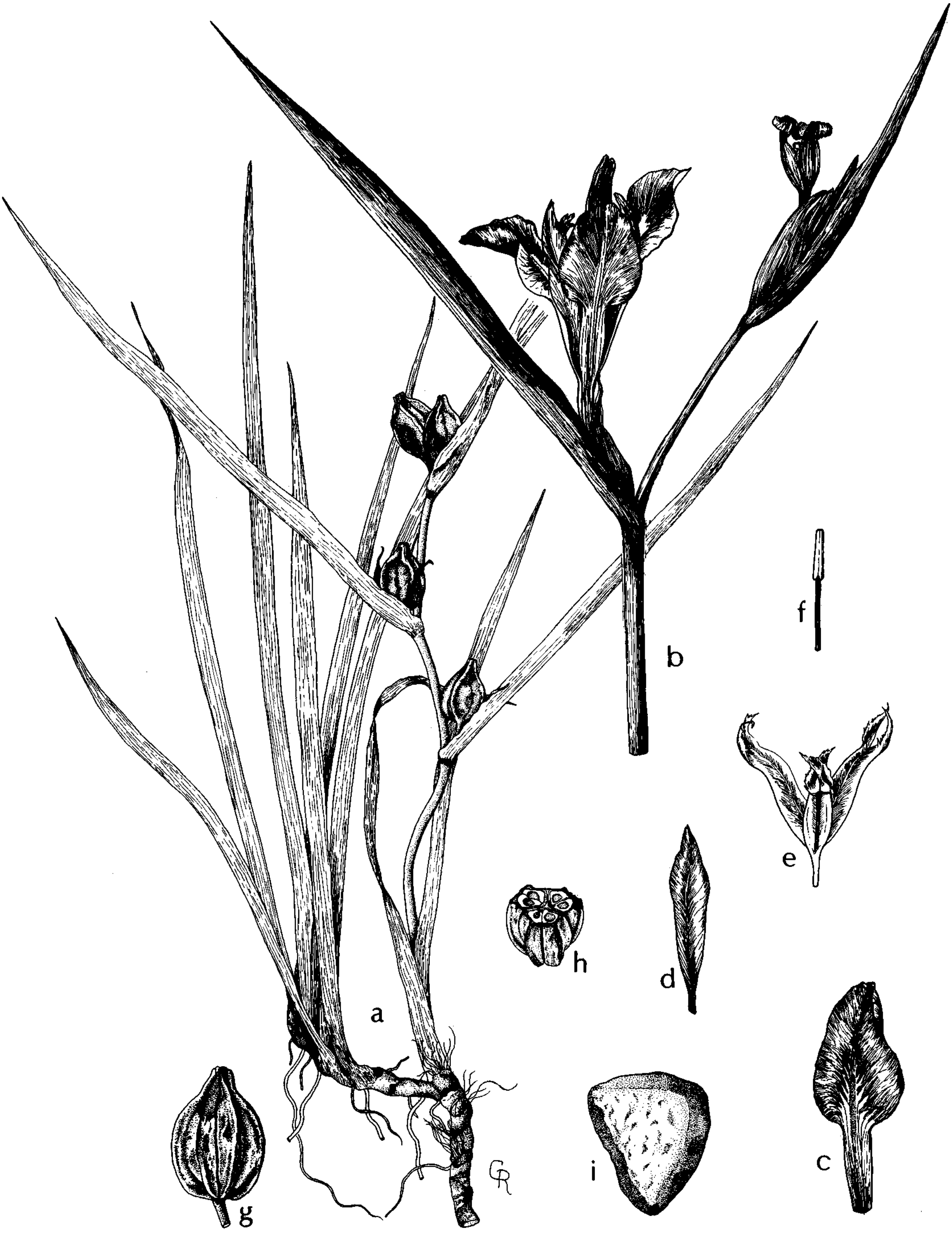


Fig. 354. **Iris hexagona:** a, habit; b, upper portion of inflorescence; c, outer perianth segment; d, inner perianth segment; e, style branches; f, stamen; g, capsule; h, capsule sectioned.

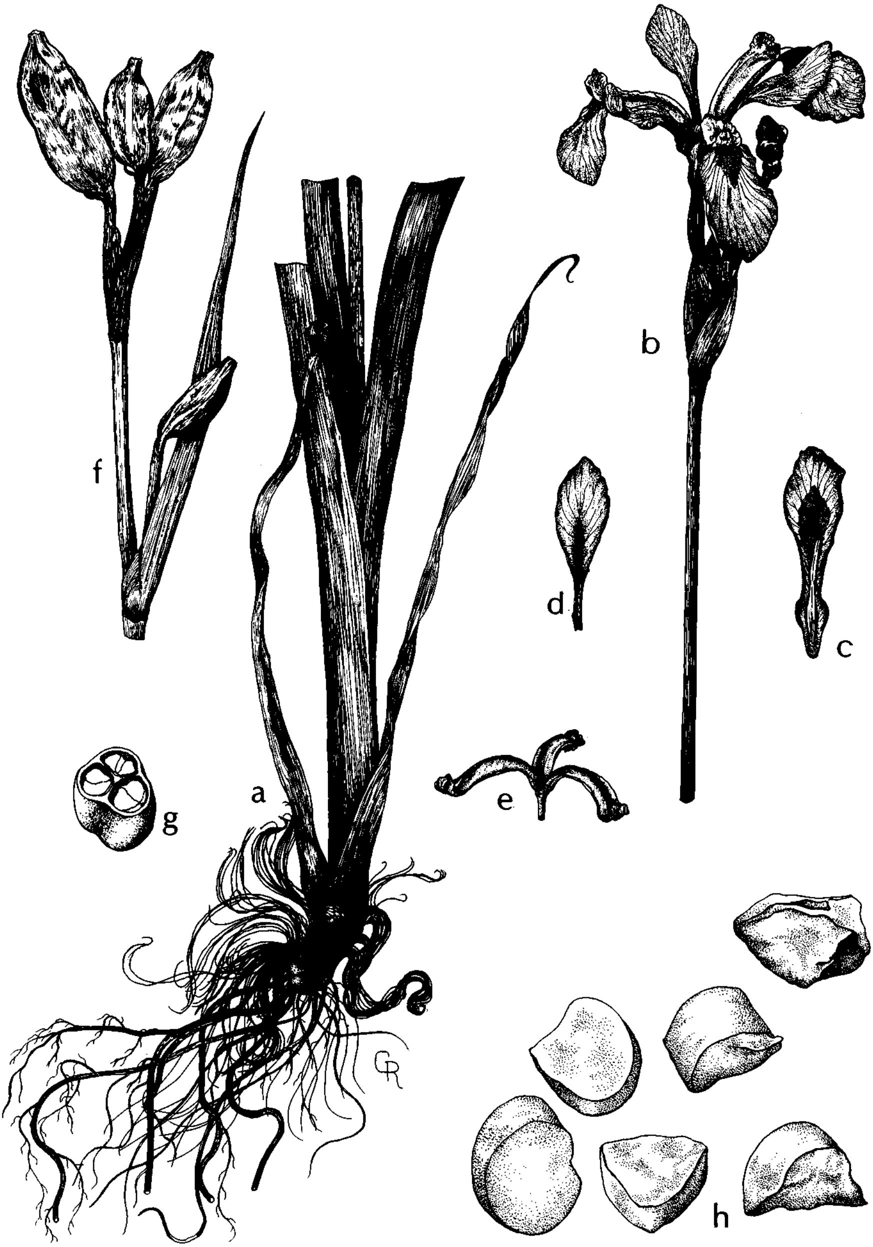


Fig. 355. **Iris virginica:** a, base of plant; b, flowering stem; c, outer perianth segment; d, inner perianth segment; e, style branches; f, fruiting stem; g, capsule in section; h, seeds.

arising from 2-bracted spathes, ephemeral, opening during daylight and lasting but a day or a part of a day. Perianth of 6 similar, separate segments in 2 series, spreading, (ours) blue, violet, lavender-rose, yellow, or white, with a distinct eye ring in the throat. Stamens 3, the filaments united, partly adnate to the perianth. Ovary inferior, the 3 style branches filiform. Fruit a globular or nearly globular loculicidal capsule. Seeds black, globose.

This is a very difficult group to understand, there being a plethora of named taxa attributed to our range. We do not pretend to know how to interpret the taxonomy or how to apply the nomenclature. The treatment below will perhaps serve, in a limited tentative fashion, to help "sort out" those which inhabit wetlands in our range.

1. Scapes unbranched, the spathes terminal and sessile, in the axil of an erect leaflike bract.
  2. Leaves and stems glaucous, the leaves capillary, in age curling, twisting, and shredding (drying grayish or silvery). 1. *S. capillare*
  2. Leaves and stems not glaucous, stiffly erect (drying green). 2. *S. mucronatum*
1. Scapes branched (some diminutive plants of numbers 3 and 4 may have unbranched scapes), or scapes bearing stalked spathes in the ultimate inflorescences.
  3. Perianth yellow or creamy white, with a brownish red eye ring and often a brownish red center line on each segment. 3. *S. exile*
  3. Perianth white, blue, violet, or lavender-rose.
    4. The perianth varying from white to lavender-rose, not blue or violet (when fresh), with a rose-purple eye ring. 4. *S. rosulatum*
    4. The perianth blue to violet (or white only in an exceptional individual).
      5. Old leaf bases persisting as tufts of bristlelike fibers about the base of the plant. 5. *S. arenicola*
      5. Old leaf bases not persisting or only a few persisting as loose irregular fibers.
        6. Stalks of the spathes conspicuously winged, the wings usually broader than the central corelike portion; capsules 4–6 mm long. 6. *S. angustifolium*
        6. Stalks of the spathes relatively filiform, the wings narrow, each wing not or scarcely exceeding the width of the central corelike portion; capsules 3–4 mm long. 7. *S. atlanticum*

1. **Sisyrinchium capillare** Bickn.

Perennial. Stems and leaves very slender, flexuous, 1.5–3 dm high, glaucous (said to be iridescent when fresh); the capillary leaves curling in age, given to shredding, drying grayish or silvery, some old leaf bases persisting as fibers. Scape unbranched, the spathes terminal and sessile, usually 2 in the axil of an erect, leaflike, filiform, flexuous bract. Spathes 1–1.5 cm long, more or less suffused with purple. Flower stalks filiform, spreading to recurving. Perianths blue-violet. Capsules 2–3 mm long, obovate.

Seasonally wet pinelands, bogs, wet clearings. S.e. Va. to Fla. and Ala.

2. **Sisyrinchium mucronatum** Michx.

Perennial. Stems and leaves slender, stiffly erect, purplish near the base, drying green above, stems 2–4 dm tall, old leaf bases persisting as fibers. Scape unbranched, the spathes terminal and sessile, usually 1, sometimes 2, in the axil of a stiffish, erect, acicular, leaflike bract 1.5–7 cm long, sometimes a little longer. Spathes about 1–2 cm long, usually more or less suffused with purple. Flower stalks filiform, spreading to recurving. Perianth violet (rarely white). Capsule 2.5 mm long, ovate-suborbicular.

Meadows, moist grassy places, open woodlands, Maine to Ont. and B.C., Mich., Minn., s. to S.C., Ga., (n. Fla.?).

3. **Sisyrinchium exile** Bickn.

Low annual. Habit variable, plants often diminutive, commonly solitary and commonly tufted (even in the same place), 4–20 cm high, in well-developed plants the tops relatively wide spreading, more or less geniculate, from a narrow basal tuft. Leaves 0.5–3 mm wide. Scapes on some plants branched, others unbranched, the branching often low on the stems, spathes stalked. Perianth yellow or creamy white, with a brown-red eye ring, often a single brown-red center line on each segment. (*S. brownei* Small ex Small and Alexander; *S. micranthum* of authors)

Native to S. Am., naturalized, often weedy, moist to wet or boggy grassy roadsides and ditches, lawns, bottomland clearings, ephemeral pools. Ga. and Fla. to s.e. Tex., Ark.

4. **Sisyrinchium rosulatum** Bickn.

Annual. Similar in general habital features to the preceding but somewhat stouter and taller, mostly 15–35 cm tall, not usually with so many diminutive individuals, if any, present locally. Leaves 2–4 mm wide. Perianths vary from white to lavender-rose, often bluish purple tinged, with yellow eye circled by a rose-purple eye ring, commonly 3 (or 1 or no) lines down each segment. (Said to hybridize with *S. exile.*)

Native of S. Am, naturalized and sometimes weedy, moist to wet roadsides, ditches, fallow fields. N.C. to Fla., w. to s.e. Tex., Ark.

A third annual species, *S. minus* Engelm. & Gray, occurs in La. and Tex. (sporadic and probably ephemeral elsewhere). Its usual perianth color is purple-rose or magenta-rose (occasionally white on individual plants amongst the usual), with yellow eye. The stamens well-exserted from the perianth in contrast to not or barely exserted in numbers 3 and 4.

5. **Sisyrinchium arenicola** Bickn.

Perennial, 3–6 dm tall. Old leaf bases persisting as a tuft of crowded erect bristles or fibers around the base of the plant. Stem and leaves sometimes slightly glaucous, 2–5 mm wide. Spathes 2–5, 1.3–2 cm long, on stalks 2–10 cm long in the ultimate inflorescence. Perianth blue-violet (rarely white). Capsules 3–5 mm high.

Usually in dry or dryish sites, fields, open woods, savannas, in the latter case possibly where seasonally wet. Coastal plain, Mass. to Fla. and Ala.

6. **Sisyrinchium angustifolium** Mill.

Perennial, loosely tufted, stems sometimes geniculate, relatively broadly winged, 2–5 dm tall. Leaves 1.5–6 mm wide, shorter than to exceeding the flowering stems. Spathes 2–5 together, 1.5–2 cm long and 4–5 mm wide, with stalks 2–15 cm long, the stalks with wings usually broader than the central corelike portion. Perianth at first pale blue (rarely white), becoming violet. Capsules 4–6 mm long. (*S. graminoides* Bickn.; not *S. angustifolium* sensu Small)

Meadows, low woodlands and thickets, shores, moist to wet clearings and grassy roadsides. Nfld., Que., s. Ont., generally s. to Fla. Panhandle and e. Tex.

7. **Sisyrinchium atlanticum** Bickn.

Similar to the preceding, more slender, mostly 1.5–3 dm tall, stems narrowly winged. Leaves 1–3 mm wide, mostly shorter than the flowering stems. Spathes mostly 2–4 together, sometimes 1, 1–1.5 cm long, 2–2.5 mm wide, on slender stalks to 7 cm long, their stalks narrowly winged, each wing not or scarcely exceeding in width the central corelike portion. Perianth blue-violet (rarely white). Capsules 3–4 mm high.

Moist to wet areas, sometimes in shallow water at least seasonally, meadows, marshes, shores, low open woodlands, wet clearings, seasonally wet savannas and flatwoods, commonly in extensive masses, especially on moist to wet roadsides. N.S. and Maine to Mich., s. to s. Fla. and s.e. Tex.

Cannaceae (CANNA FAMILY)

Canna (CANNAS, INDIAN-SHOTS)

Perennial erect herbs, stems stout, simple or 2 or more from basal offshoots. Leaves large, alternate, with sheathing petioles. Flowers bisexual, bilaterally symmetrical, very showy, terminal, in spikes, racemes or panicles. Sepals 3, greenish and bractlike; petals 3, sepal-like, mostly narrow and pointed, exceeding the sepals, alternate with them, one smaller than the others. Floral parts partly united to form a tube. Stamens 3, 2 petaloid, comprising the showy part of the flower, one narrower and bearing 1 fertile anther on its side. Style single, long, prominent in the center of the flower. Ovary inferior. Fruit a 3-valved roughened capsule. Seeds brown to black, spherical.

- Staminodia yellow; leaves large, 3–6 dm long, 5–15 cm wide, very broadly oblong-lanceolate, green. 1. *C. flaccida*
- Staminodia red; leaves 2–4 dm long, oblong to oblong-elliptic, green or commonly suffused with reddish purple pigment. 2. *C. indica*

1. Canna flaccida Salisb. GOLDEN CANNA. Fig. 356

Leaves 30–60 cm long, 5–15 cm wide, oblong-lanceolate, 4–6 times longer than broad. Staminodial tube about 5 cm long about equal to the petals, sepals about 2.5 cm long; staminodes yellow, margins curly, 5–7 cm long. Capsule 3.5–5 cm long.

Edges of ponds, lakes, marshes, savannas. Coastal plain, S.C. to Fla. and Tex.

2. Canna indica L. INDIAN-SHOT.

Leaves 20–40 cm long, to 20 cm wide, oblong to oblong-elliptic, 2 times as long as broad. Staminodial tube exceeded by sepals, 1–1.5 cm long; staminodes red, 3–3.5 cm long. Capsule 2.5–3.5 cm long.

Native to E.I. Commonly cultivated and escaped to low wet ground. Gulf coastal plain, Fla. to Tex.

C. × *generalis* Bailey, a cultivar, infrequently escapes to roadside ditches or other wet sites in our area. It combines characters of a series of horticultural hybrids from the 2 preceding species in being glaucous throughout, staminodia yellow or red, staminodial tube longer than the sepals, but petals longer than the tube.

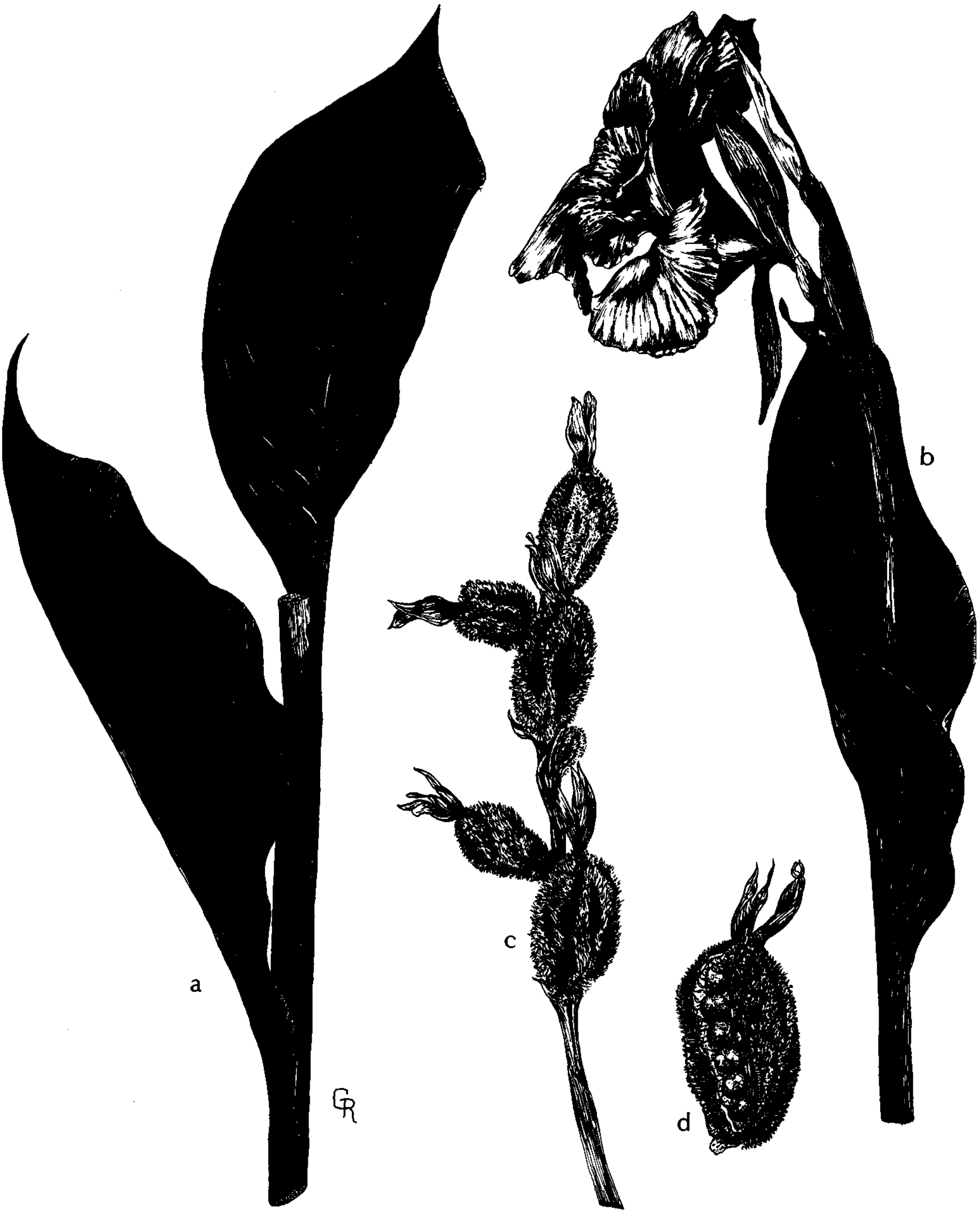


Fig. 356. **Canna flaccida:** a, midsection of stem; b, inflorescence; c, fruiting stem; d, capsule partially sectioned.

Marantaceae (ARROWROOT FAMILY)

Thalia

Robust erect perennial herbs from thick rhizomes, frequently glaucous throughout. Leaves alternate, basal, long-petioled, with a ligulate articulation at the point of union with the blade; bases variable, from cordate to truncate. Inflorescence terminal, tall-scapose, of panicled spikes, the axes zigzagging. Flowers bisexual, in pairs, subtended by 2 persistent bracts. Sepals 3, minute. Petals 3, distinct, purple, 1 lanceolate, 2 obovate. Staminodia purplish, petal-like, medial one largest, broad, liplike, bearing a fertile stamen. Ovary inferior, 3-locular. Fruit a bluish purple utricle.

- Flowers closely crowded on rachis the intervals zig-zag and 2–3 mm long; fruit subglobose. 1. *T. dealbata*
- Flowers separated on the rachis, the zig-zag intervals 5–10 mm long; fruit oval. 2. *T. geniculata*

1. Thalia dealbata Roscoe. POWDERY-THALIA. Fig. 357

Leaves large, broadly ovate-lanceolate to elliptic-lanceolate, 3–5 dm long, to 2 dm wide, somewhat asymmetrical; petioles to 8 dm long. Panicle narrowly and stiffly branched, the zigzag internodes short. Clusters of bracts and bractlets ovoid. Utricle subglobose, 10–15 mm in diameter.

In water of ditches, margins of swamps, edges of ponds and in marshes. Coastal plain, S.C. to Tex., Okla., Mo.

2. Thalia geniculata L.

Leaves large, broadly lanceolate to ovate-lanceolate, 3–8 dm long, to 2 dm wide, somewhat asymmetrical, petioles long. Panicle widely and loosely branched, the zigzag internodes long. Clusters of bracts and bractlets conic. Utricle oval, 6–7 mm in diameter.

Ponds, wet ditches, swamps, river shores, marshes. Fla.; W.I.

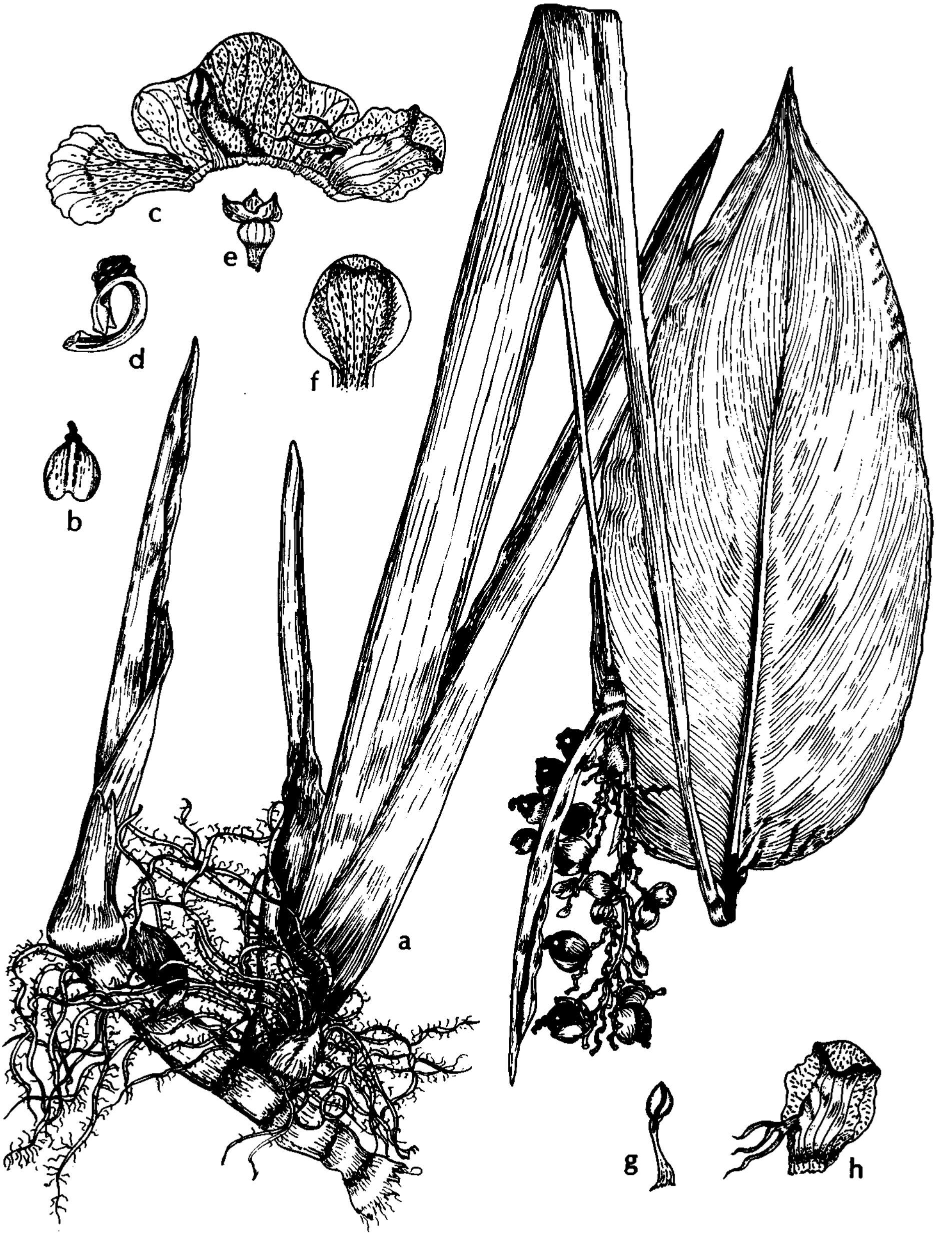


Fig. 357. **Thalia dealbata:** a, plant; b, individual bract; c, combined outer staminode, stamen, calloused staminode, cucullate staminode; d, pistil and stigmatic surface; e, ovary; f, outer staminode; g, stamen; h, cucullate staminode. (From Correll and Correll)

Burmanniaceae (BURMANNIA FAMILY)

- Floral tube 3-angled or 3-winged surmounted by minute perianth segments; ovary 3-locular. 1. *Burmannia*
- Floral tube terete, surmounted by a perianth about 8 mm long; ovary 1-locular. 2. *Apteria*

1. Burmannia

Diminutive herbs with erect filiform stems and threadlike roots. Leaves alternate, mostly tiny and bractlike or scalelike, remote, borne at only a few nodes. Flowers solitary and terminal, more often in a terminal cluster or cyme, each subtended by 2 or more bracts. Ovary inferior; floral tube 3-angled or 3-winged, surmounted by 6 similar perianth segments in 2 series, the outer somewhat longer than the inner (or the inner lacking), subtended by 2 or more bracts. Stamens 3, almost sessile, attached to the perianth tube. Capsule irregularly dehiscent, 2–5 mm long, bearing numerous tiny yellowish seeds.

1. Floral tube obtusely 3-angled, greenish white or cream, or very lightly tinged blue; flowers essentially sessile, few–several in a capitate cluster (sometimes but 1–2). 1. *B. capitata*
1. Floral tube 3-winged, at least below, violet or yellow; flowers on short pedicels, in loose cymose clusters (sometimes but 1–2).
  2. Wings violet, broad and extending the length of the floral tube. 2. *B. biflora*
  2. Wings yellow, narrow and only on the lower portion of the floral tube. 3. *B. flava*

1. Burmannia capitata (Walt.) Mart. Fig. 358

Stem usually unbranched, 5–20 cm tall. Leaves scalelike to 3 mm long, remote. Floral bracts ovate, 3 mm long, flowers few to several in a terminal cluster, or 1–2, greenish white or cream, sometimes tinged with blue, about 5 mm long; floral tube wingless, obtusely 3-angled.

Moist soil of pond margins, low pinelands, bogs, ditches. Coastal plain, Va. to Fla. and Tex.: W.I., S.Am.

2. Burmannia biflora L. Fig. 359

Stem usually unbranched, rarely branching, 3–14 cm tall. Leaves 1–2 mm long. scalelike, remote. Flowers solitary at the top of the stem or in loose terminal cymose clusters. Floral bracts ovate, 3–4 mm long. Floral tube broadly 3-winged the length of the tube, violet, about 5 mm long. Capsule 4–5 mm long. Seed fusiform with surface reticulation.

Moist to wet soil of savannas, pine flatwoods and bogs. Coastal plain, Va. to Tex.; S. Am.

3. Burmannia flava Mart.

Stem usually unbranched, rarely branching, to 6 cm long. Basal leaves present; scale leaves of stem 2-4 mm long. Floral bracts lanceolate, 4–5 mm long, flowers in a terminal cluster. Floral tube narrowly winged at the base, yellow, 9–11 mm long.

Big Cypress Swamp, s. Fla.; Cuba, C.Am.

2. Apteria

Apteria aphylla (Nutt.) Barnhart. NODDING-NIXIE. Fig. 358

Diminutive erect perennial herb with slender branched or unbranched upright stems to 2 dm tall. Stem leaves scalelike, to 3 mm long. Flowers in racemes, nodding, long pedicellate. Perianth 10–20 cm long, white to purple; outer 3 lobes much broader than the 3 inner. Floral tube terete. Stamens 3, filaments winged. Capsule 5–8 mm long, ovoid. Seeds small, light brown.

Swampy woods, edges of bogs, hammocks. Ga., Fla., to Tex., W.I.

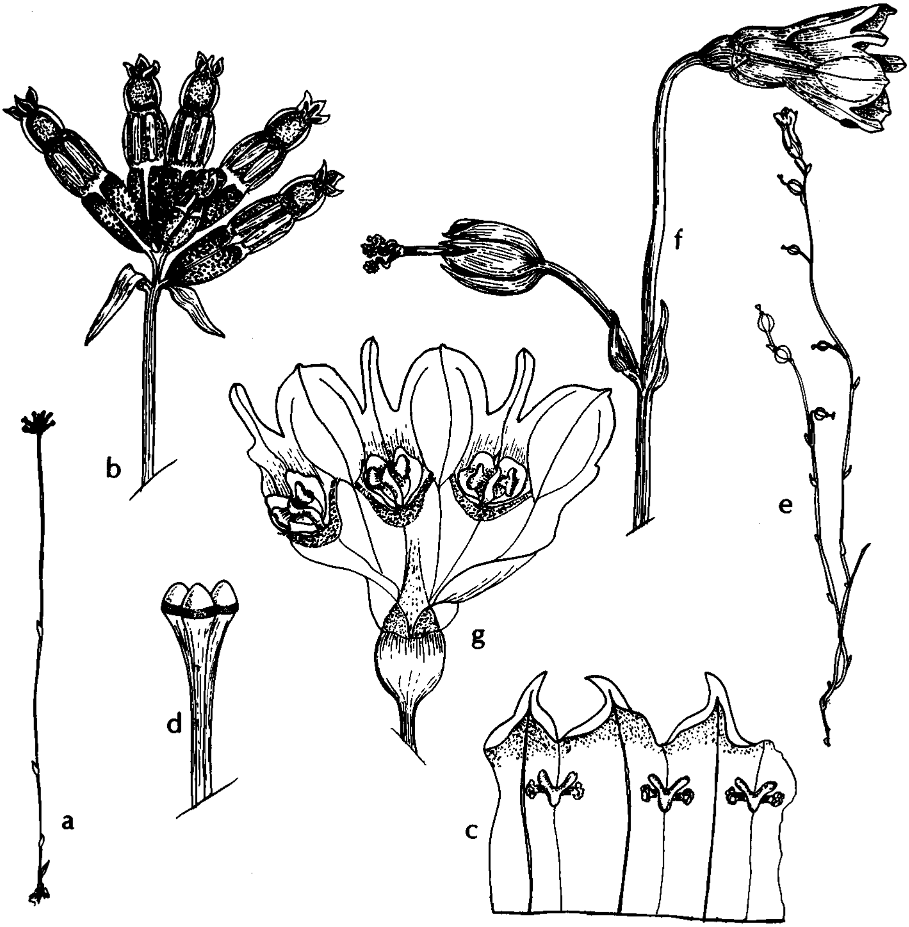


Fig. 358. a–d, **Burmannia capitata:** a, habit; b, flowers with developing capsules; c, flower, open; d, style and stigma; e–g, **Apteria aphylla:** e, habit; f, flowers; g, flower open. (From Correll and Correll)

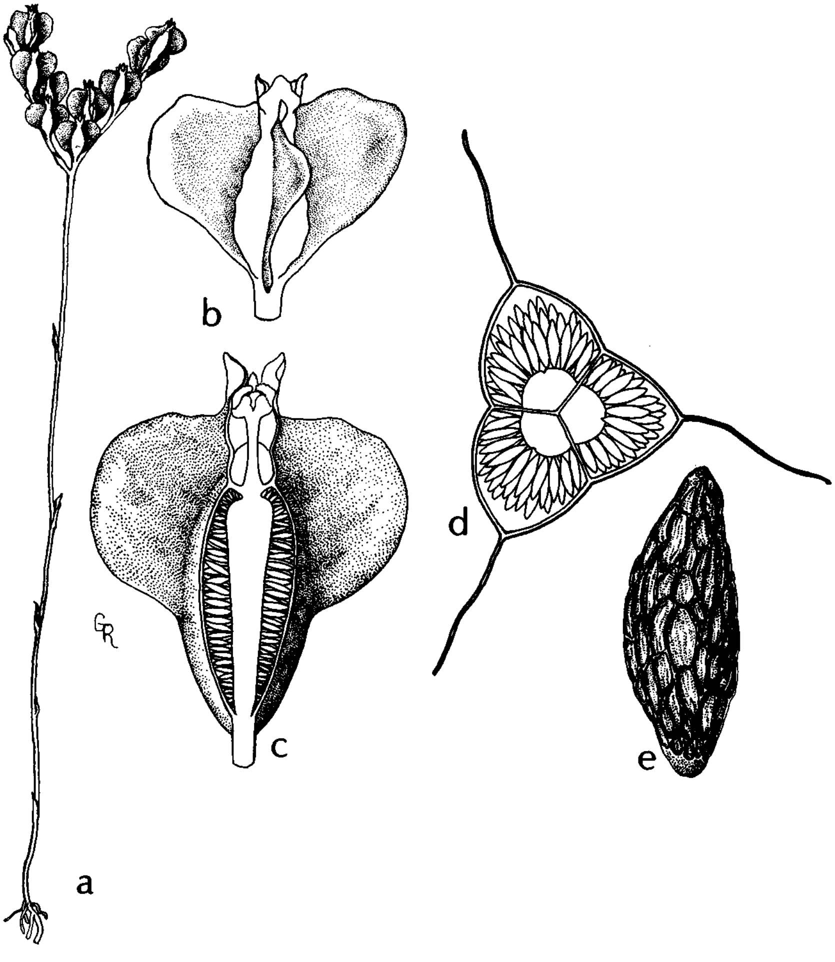


Fig. 359. **Burmannia biflora:** a, habit; b, flower; c, flower sectioned longitudinally; d, ovary sectioned transversely; e, seed.

Orchidaceae (ORCHID FAMILY)

(Contributed by Donovan S. Correll)

Perennial, terrestrial, epiphytic or semiaquatic, autophytic or saprophytic herbs from a short or elongate, coralloid rhizome, corm or tuber. Roots subterranean or aerial, fibrous, fleshy or tuberous, solitary, fasciculate or scattered on the rhizome. Stems terete, or occasionally angled, slender to very stout, naked, bracteate or leafy. Leaves simple, basal or cauline or both, sometimes altogether lacking, varying from foliaceous sheathing bracts to a broad or narrow lamina; lamina filiform to orbicular, membranous to fleshy or coriaceous, sometimes duplicate or plicate. Inflorescence terminal or lateral, commonly a spike, simple raceme or panicle, or flower solitary. Flowers small and inconspicuous to large and showy, perfect, zygomorphic. Perianth composed of 3 outer segments (sepals) and 3 inner segments (petals), the segments free or more or less united, adnate to the 1- or 3-celled inferior ovary, one petal (lip) usually complex in structure and differing only slightly to greatly in form, size and coloration from the other petals; lip often extended at the base and forming a spur or nectary. Stamens and pistils (including the filaments and styles) united to form, in part, an organ called the column in the center of the flower; column various, bearing at or near its summit or laterally 1 or 2 mobile or rigidly attached anthers situated behind the rostellum (an extension from the upper edge of the stigma), producing in front on the ventral surface the somewhat confluent stigmas, with one stigma usually modified to form the rostellum, often produced below into a foot (an extension of the base of the column beyond its point of attachment to the receptacle); pollen usually in pollinia (masses of waxy pollen or of coherent pollen grains). Fruit a dry capsule or fleshy pod. Seeds numerous, very, very tiny.

[The authors arbitrarily chose not to have included in this work the epiphytic orchids occurring, in the range, almost exclusively in peninsular and south Florida.]

1. Lip produced into a prominent spur at the base.
  2. Roots not from the nodes of a rhizome (plant not rhizomatous though *Habenaria repens* may have adventitious roots on the lower stem and may have rootless stolons). 1. *Habenaria*
  2. Roots from the nodes or a rhizome. 11. *Erythrodes*
1. Lip not with a prominent spur at the base, at most saccate.
  3. Leaves absent at flowering time.
    4. Plant with a thickened corm.
      5. Lip cuneate at the base (distribution n. of Fla.).
        6. Lip with a bearded crest, entire or at most shallowly 3-lobed. 7. *Arethusa*
        6. Lip without a bearded crest, deeply 3-lobed. 15. *Aplectrum*
      5. Lip broadly rounded at the base (in our range limited to s. Fla.). 16. *Bletia*
    4. Plant not with a thickened corm. 10. *Spiranthes*
  3. Leaves present at flowering time.
    7. Lip forming the uppermost segment of the perianth.
      8. Lip prominently bearded. 8. *Calopogon*
      8. Lip not prominently bearded.
        9. Leaves 1 or 2 (rarely more), with expanded blades well above the base of the stem. 13. *Malaxis*
        9. Leaves several in a basal rosette or at least closely disposed near the base of the stem. 9. *Ponthieva*
    7. Lip forming the lowermost segment of the perianth.
      10. Leaves plicate (folded into plaits lengthwise).
        11. Flower solitary (rarely 2). 7. *Arethusa*
        11. Flowers several to many.
          12. Lip unlobed, broadest above the middle. 14. *Liparis*
          12. Lip 3-lobed, broadest below the middle.
            13. The lip lamellate-crested; floral bracts inconspicuous. 16. *Bletia*

13. The lip papillose-crested, floral bracts conspicuous. 17. *Eulophia*
10. Leaves duplicate (with the halves either side of the midrib similar and not plaited), either fleshy or membranous.
14. Stem arising from a small bulbous corm.
15. Lip broadest above the middle. 14. *Liparis*
15. Lip broadest below the middle. 13. *Malaxis*
14. Stem not arising from a small bulbous corm, sometimes from a small tuber.
16. Leaves alternate or solitary.
17. Flowers numerous (in species here treated) in a more or less spirally twisted spike, or at least secund on the axis. 10. *Spiranthes*
17. Flowers few–numerous, neither spirally nor secund on the spike.
18. Leaves with inflated tubular sheaths; roots from the nodes of a rhizome. 12. *Zeuxine*
18. Leaves not having inflated tubular sheaths; roots not from a rhizome.
19. Leaves several, somewhat bractlike, ovate to ovate-orbicular, conspicuously clasping the stem. 3. *Triphora*
19. Leaves solitary, elliptic to elliptic-lanceolate.
20. Sepals pink to rose (rarely white); lip 2.5 cm long or less. 5. *Pogonia*
20. Sepals brownish to purplish; lip 3 cm long or more. 6. *Cleistes*
16. Leaves opposite or whorled.
21. Leaves 2, opposite, near the middle of the stem. 2. *Listera*
21. Leaves 5–6 in a whorl at the summit of the stem and subtending the flower. 4. *Isotria*

1. Habenaria

Terrestrial or semiaquatic herbs; roots fleshy or tuberous, ovoid to fusiform-elongated or rarely palmate. Stems erect, simple, glabrous, leafy or merely bracteate. Leaves one or more, basal or cauline, essentially sessile, with the basal part sheathing the stem. Flowers in showy or inconspicuous racemes; sepals free, similar or dissimilar; dorsal sepal erect or incurved to form a hood over the column; lateral sepals spreading or reflexed; petals free, erect, usually connivent with the dorsal sepal, simple or bipartite; lip lowermost or occasionally uppermost, simple, trilobed or tripartite (the divisions cuneate to filiform-setaceous, entire or variously toothed or fringed), entire, toothed or fringed, extended at the base into a spur; spur rarely longer than the pedicel; column short; stigmas with or without papillose processes; anther-cells 2, separate, relatively distant. Capsules narrowly cylindric to ellipsoid.

1. Lip deeply 3-parted, that is divided at least halfway to the base of the lamina.
2. Divisions of the lip fringed or conspicuously crenate or eroded; petals simple (not 2-parted), either crenate or fringed on the margin.
3. Lateral divisions of the lip capillary-fringed ⅔ or more of the distance to the base.
4. Petals narrowly cuneate to flabellate-dilated, with the apical margin eroded or dentate; flowers white, tinged with cream-color. 1. *H. leucophaea*
4. Petals linear-oblong to oblong-spatulate, entire (rarely denticulate); flowers pale yellowish or whitish green. 2. *H. lacera*
3. Lateral divisions of the lip fringed at most halfway to the base or merely eroded.
5. Divisions of the lip irregularly eroded, with the middle division deeply notched at the apex; petals coarsely eroded or entire. 3. *H. peramoena*
5. Divisions of the lip copiously fringed; petals finely toothed. 4. *H. psycodes*
2. Divisions of the lip not fringed, entire, oblong to linear-filiform; petals simple or 2-parted.
6. Spur more than 4 cm long, much longer than the pedicillate ovary; lateral divisions of the lip 1.5 cm or more long. 5. *H. quinqueseta*
6. Spur less than 2 cm long, about as long as the pedicillate ovary; lateral divisions of the lip less than 1.3 cm long.
7. Leaves essentially basal; raceme laxly few-flowered; spur slenderly clavate. 6. *H. distans*
7. Leaves scattered along the stem; raceme compact, many-flowered; spur filiform. 7. *H. repens*

1. Lip simple (not 3-parted).
8. The lip copiously ciliate-fringed.
9. Flowers white, occasionally tinged with cream-color; lip narrowly ovate-oblong. 8. *H. blephariglottis*
9. Flowers yellow or orange; lip ovate to oblong.
10. Lip ovate, less than 6 mm long; spur shorter than the pedicillate ovary. 9. *H. cristata*
10. Lip oblong, more than 8 mm long; spur longer than the pedicillate ovary. 10. *H. ciliaris*
8. The lip not fringed, at most coarsely erose.
11. Lip entire or only crenate, not noticeably lobed or notched.
12. Flowers lemon yellow to bright orange. 11. *H. integra*
12. Flowers white or greenish.
13. Lip uppermost; flowers snowy white. 12. *H. nivea*
13. Lip lowermost; flowers greenish. 13. *H. flava*
11. Lip angled or lobed at the base *or* trilobulate or tridentate at the apex.
14. The lip lobed or angled at the base.
15. Larger stem leaves 2–3; lip with a tubercle in the center near the base. 13. *H. flava*
15. Larger stem leaves 4–9; lip without a tubercle in the center near the base. 14. *H. strictissima* var. *odontopetala*
14. The lip neither lobed nor angled at the base, either trilobulate or tridentate at the apex. 15. *H. clavellata*

1. Habenaria leucophaea (Nutt.) A. Gray. PRAIRIE WHITE FRINGED ORCHID. Fig. 360

Plant 2–12 dm tall. Stem angled, leafy. Leaves oblong-elliptic to lanceolate, 7–20 cm long, 1–4 cm wide. Raceme loosely flowered, 5–22 cm long, 4–10 cm across. Flowers white, slightly tinged with green or cream-color, with long recurved pedicellate ovaries 2–3 cm long. Sepals and petals overlapping and directed forward to form a conspicuous hood over the column. Dorsal sepal ovate to oblong-elliptic, rarely slightly toothed at the apex, 7–16 mm long, 5–8 mm wide; lateral sepals somewhat obliquely ovate to orbicular-ovate, 7–16 mm long, 5–10 mm wide. Petals narrowly cuneate to flabelliform, broadly rounded to truncate at the apex, eroded or coarsely toothed along the apical margin, 7–17 mm long, 4–12 mm wide near the apex. Lip deeply tripartite, with the divisions coarsely fringed halfway to the base or more; lateral divisions broadly cuneate. Spur prominently curved and clavate, usually much longer than the pedicellate ovary, 2–5.5 cm long. (*Blephariglottis leucophaea* (Nutt.) Farw.)

Wet depressions in prairies, mossy bogs, meadows, stony shores, herb mats and in sphagnum-sedge bogs on lake margins, bogs in coniferous forests. N.S., Maine, Ont., N.Y. through Mich., Ohio, Ind., Ill., Mo., Ark., La.; Kans., Nebr., Minn., N.Dak., S.Dak.

2. Habenaria lacera (Michx.) Lodd.
RAGGED FRINGED ORCHID, RAGGED ORCHID, GREEN FRINGED ORCHID. Fig. 361

Plant 2.5–7.5 dm tall. Stems somewhat ribbed, leafy below, bracted above. Leaves rather rigid, erect, linear-oblong to oblong-obovate or linear-lanceolate, 7–21 cm long, 1.5–5 cm wide. Raceme loosely or densely flowered, 3–26 cm long, 3–4.5 cm across. Flowers pale yellowish green or whitish green, with rather stout arcuate pedicellate ovaries 1.5–2 cm long. Dorsal sepal ovate to elliptic, obtuse, 4–6 mm long; lateral sepals obliquely ovate, obtuse, 4–6 mm long, about 3 mm wide. Petals linear-oblong to narrowly oblong-spatulate, entire or rarely slightly toothed at the truncate or rounded (rarely retuse) apex, somewhat oblique, 5–7 mm long, mostly less than 2 mm wide. Lip deeply tripartite; lateral divisions deeply cut (usually nearly to near the base) into three lobes, with the lobes again subdivided; middle division slender, clavate to narrowly cuneate or linear-spatulate, somewhat spreading above into irregular slender or coarse fringes, rarely erose to short-fringed at the apex, often laciniate halfway or more to the base. Spur curved, slender or clavellate, as long as or longer than the pedicellate ovary. (*Blephariglottis lacera* (Michx.) Farw.)

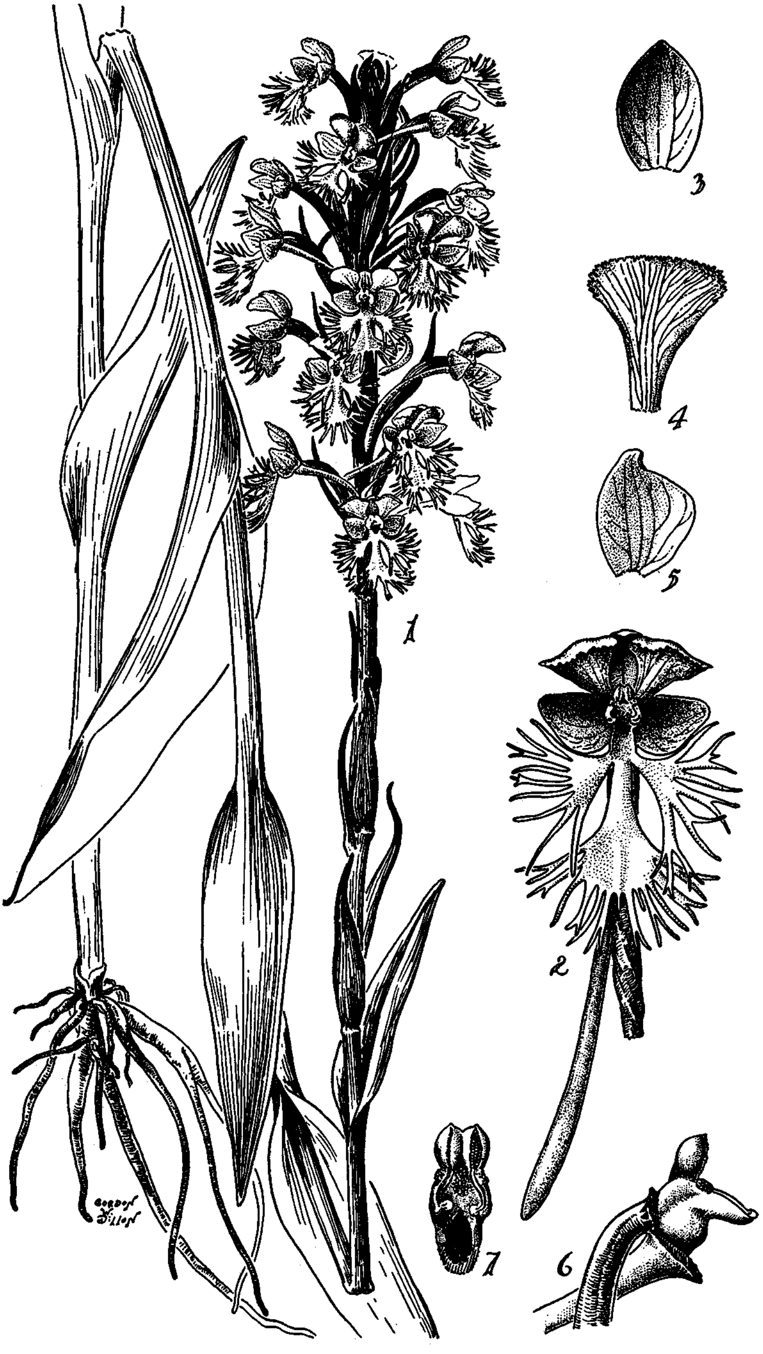
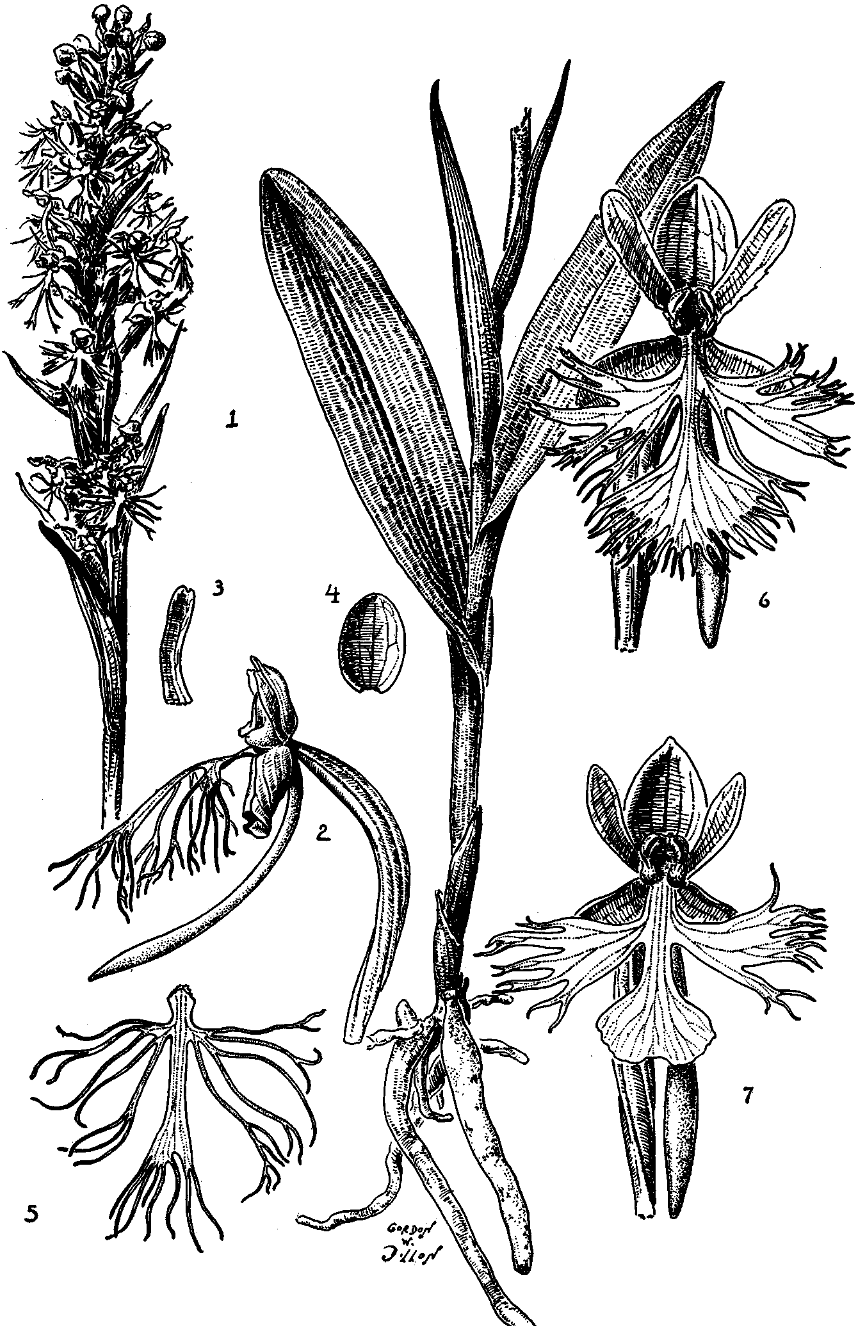


Fig. 360. **Habenaria leucophaea:** 1, plant; 2, flower; 3, dorsal sepal; 4, petal; 5, lateral sepal; 6, column, with base of spur and upper part of ovary, side view, with floral segments removed; 7 column, front-ventral view.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GORDON W. DILLON

Fig. 361. 1–5, **Habenaria lacera:** 1, plant; 2, flower, side view; 3, petal; 4, dorsal sepal; 5, lip, from above; 6–7, **Habenaria × andrewsii** White ex Nile, putative hybrid between *H. lacera* and *H. psycodes:* flowers.

Open sedge swamps and marshes, bogs, meadows, swampy woods and wet or occasionally dry open fields and prairies, marshy borders of lakes, cranberry bogs. Nfld. to Man., s. to S.C., Ga., n.e. Tex., Okla.

3. **Habenaria peramoena** A. Gray. PURPLE FRINGELESS ORCHID, PURPLE SPIRE ORCHID. Fig. 362

Plant 3.5–10.5 dm tall. Leaves linear-elliptic to oblong-elliptic or lanceolate, rather stiffly erect, 7–13 cm long, 1.2–5 cm wide. Raceme densely or loosely flowered, cylindrical, 6–17 cm long, 4–7 cm across. Flowers rich violet-purple, rose-purple or phlox-purple, showy, with slender pedicellate ovaries about 2 cm long. Dorsal sepal oblong-elliptic to suborbicular, obtuse, 5–8 mm long, 4–8 mm wide; lateral sepals obliquely ovate to suborbicular, rounded to obtuse at the apex, somewhat reflexed, 6–8 mm long, 3–6 mm wide. Petals somewhat obliquely spatulate to oblong-linear, with undulate-crenate margins, broadly rounded to obtuse or rarely subacute at the apex, 4–8 mm long, 2–5 mm wide, rarely with a protuberant tooth on the side near the base. Lip deeply tripartite, the divisions narrowly to broadly cuneate; middle division broadly cuneate to flabellate, deeply notched at the apex. Spur curved, slender-clavate, 2–3 cm long. (*Blephariglottis peramoena* (A. Gray) Rydb.)

Moist woods, meadows, stream banks, low alluvial woods, swampy fields. N.J. and w. N.Y. to Ohio and Mo., s. to N.C., Tenn., Ala.

4. **Habenaria psycodes** (L.) Spreng.
SMALL PURPLE FRINGED ORCHID, BUTTERFLY ORCHID. Fig. 363

Plant somewhat succulent, 1.5–9.5 dm tall. Leaves up to five in number, elliptic-oblong to narrowly lanceolate or often oblong-obovate, 5–22 cm long, 1.5–7 cm wide. Raceme densely or laxly flowered, cylindrical, 3–20 cm long, 2.5–5 cm across. Flowers lilac-lavender to pinkish purple, rarely almost white, with short pedicellate ovaries about 1 cm long. Dorsal sepal elliptic to oblong-elliptic, concave, obtuse to acute, 5–6.5 mm long, 2–4 mm wide; lateral sepals obliquely ovate, obtuse to acute, 4–7 mm long, 3–4 mm wide. Petals orbicular-obovate to narrowly oblong-cuneate or spatulate, coarsely and irregularly dentate along the margins, 4–9 mm long, 3–7 mm wide. Lip deeply tripartite, the divisions coarsely and shallowly toothed along the apical margin (usually cut about ⅓ of the way to the base); lateral divisions broadly cuneate; middle division broadly cuneate to flabellate. Spur slender, recurved, often clavellate, longer than the pedicellate ovary (often twice as long). (*Blephariglottis psycodes* (L.) Rydb.)

Upland meadows, sedge and grass swamps, open woods, pastures, wet weedy soil, sphagnum bogs, cedar or alder swamps and alluvial thickets. Nfld., N.S., P.E.I., to n.w. Ont., in the mts. to Ga., Tenn., Ohio, Ind., Ill., Mich., Wis., Iowa.

5. **Habenaria quinqueseta** (Michx.) A. Eaton. LONG HORNED HABENARIA. Fig. 364

Plant 2–9 dm tall, the stem erect, leafy (occasionally with the leaves mostly basal). Leaves thin and chartaceous when dry, rather fleshy when fresh, oblong-elliptic to elliptic-lanceolate or oblong-obovate, broadly rounded to acute or acuminate at the apex, reduced above to clasping ovate-acuminate bracts, 6–25 cm long, 2.5–6 cm wide. Raceme elongate, laxly few–many-flowered, 7–25 cm long, 5–6 cm across. Flowers greenish white, with slender pedicellate ovaries 2–3 cm long. Dorsal sepal oblong-elliptic to suborbicular, obtuse to rarely acute, concave, 6–13 mm long, 5–10 mm wide at the middle. Lateral sepals ovate-oblong to oblong-lanceolate or oblong-elliptic, obtuse to acute, oblique, 8–16 mm long, 4–7 mm wide below the middle. Petals bipartite; posterior division erect, linear-oblong, falcate, obtuse to acute, 6–15 mm long, about 2 mm wide; anterior division filiform, almost twice as long as the posterior, recurved at the apex, 1.3–2.5 cm long; middle division linear, with revolute margins, 8–20 mm long, 2–3 mm wide. Spur varying from slender to strongly clavellate, recurved, 4–18 cm long. (Including *H. habenaria* (L.) Small)

Low pinelands, pine or oak flatwoods, hammocks, occasionally in swamps. Local, S.C. and Ga., Fla., w. to Tex.; W.I.; Mex. to S.Am.

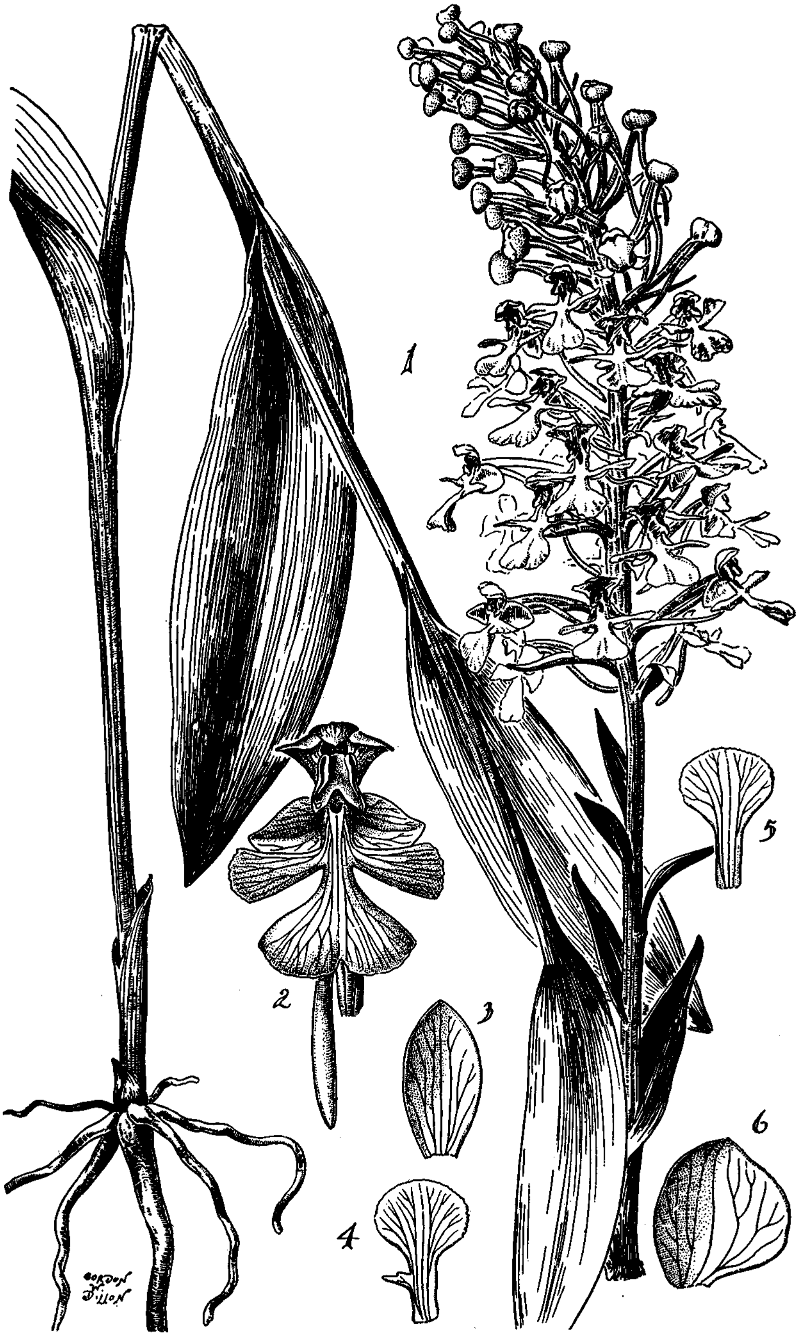
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Fig. 362. **Habenaria peramoena:** 1, plant; 2, flower, partly spread open; 3, dorsal sepal; 4, petal, with a spur on the claw; 5, petal, "typical"; 6, lateral sepal.

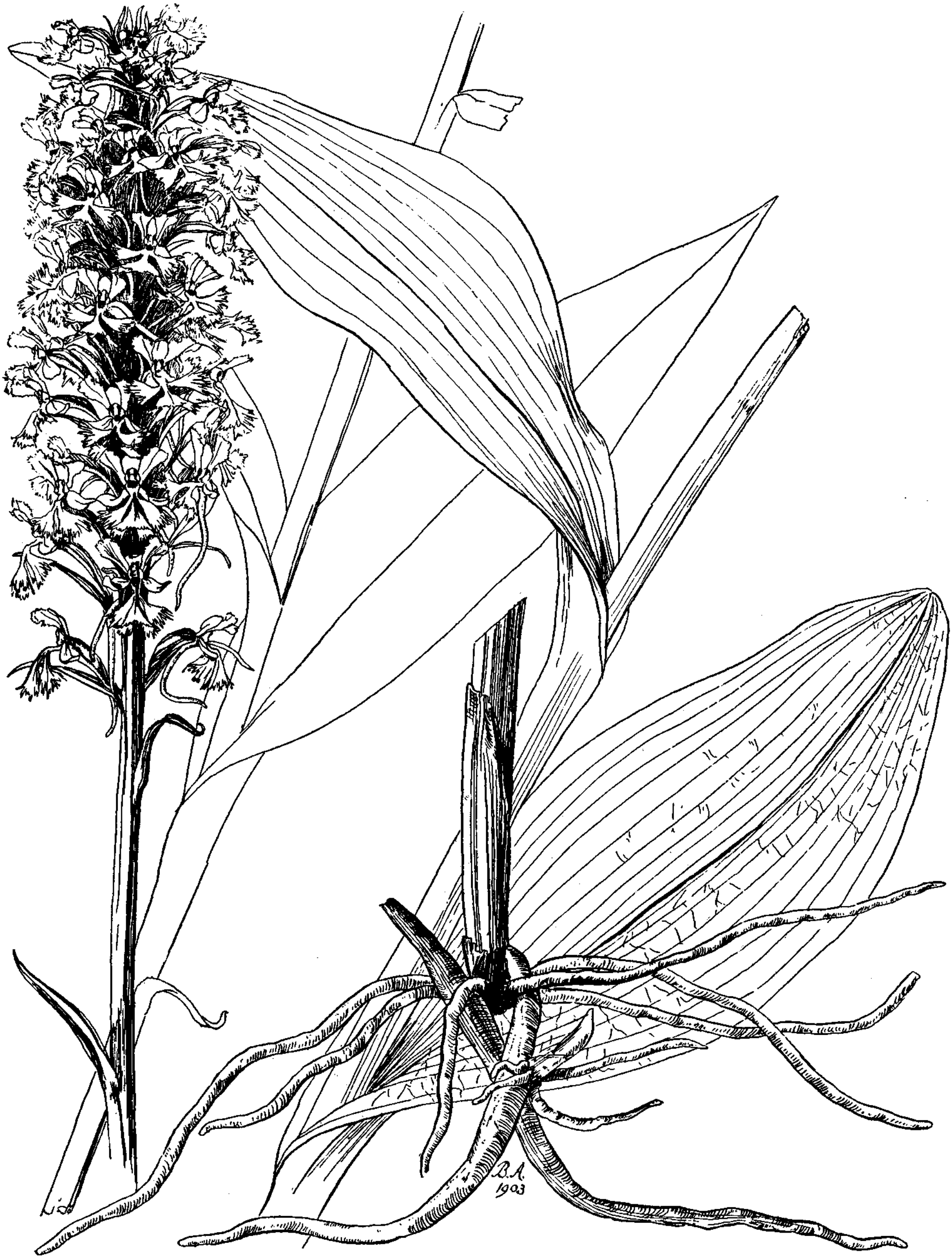

Fig. 363. **Habenaria psycodes.**

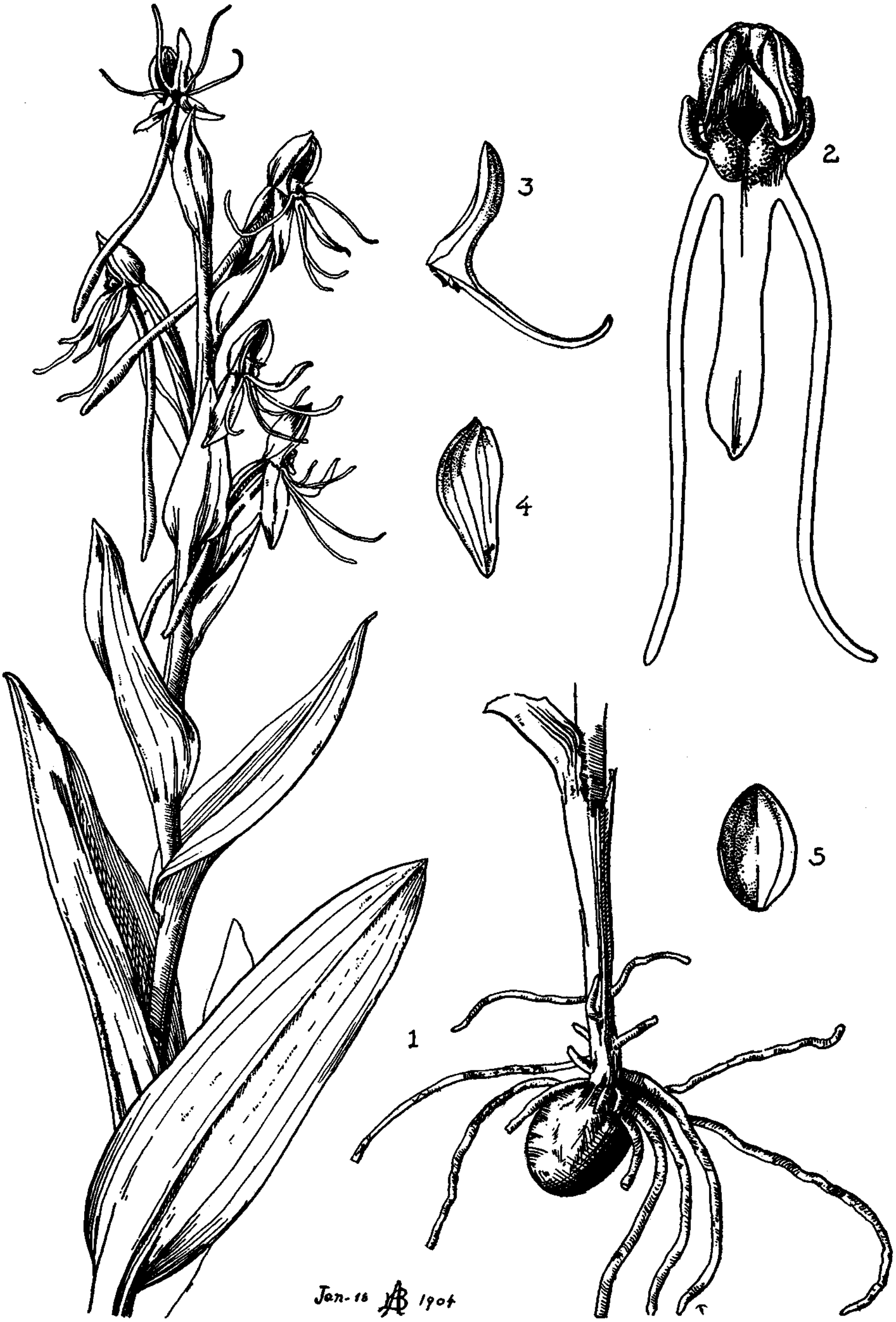
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Fig. 364. **Habenaria quinqueseta:** 1, plant; 2, lip and column, front view; 3, petal; 4, lateral sepal; 5, dorsal sepal.

6. Habenaria distans Griseb. Fig. 365

Plant slender, 1.4–3.3 dm tall. Leaves 2–6, essentially basal, often forming a rosette, oblong-elliptic to rarely ovate or obovate, acute, abruptly diminishing into bracts above, 6–15 cm long, 2–5 cm wide. Raceme lax, of 5–21 scattered flowers, 4–13 cm long. Flowers greenish, with slender pedicellate ovaries 1–1.5 cm long. Dorsal sepal oblong-elliptic, obtuse to subacute, concave, 5–8 mm long, 4–5 mm wide; lateral sepals somewhat reflexed and upcurved at the apex, obliquely elliptic to ovate-oblong, acute, 5–8 mm long, 2–3 mm wide at the widest point. Petals bipartite, the two divisions about equal in length; posterior division suberect, narrowly linear, falcate, about 1 mm wide, anterior division filiform, usually slightly longer than the posterior. Lip deeply tripartite; lateral divisions filiform, spreading, curved upward, 8–11 mm long, middle division narrowly linear, pendent, 7–10 mm long. Spur slender-clavate, recurved, about as long as the pedicellate ovary.

Low moist hammocks. S. cen. pen. Fla.; s. Mex. to C.R., Cuba, P.R., S.Dom., Haiti, Jam., n. S.Am.

7. Habenaria repens Nutt.
WATER SPIDER ORCHID, CREEPING ORCHID, FLOATING ORCHID. Fig. 366

Plant slender to stout, leafy, 1–9 dm tall. Lower stem often producing few–numerous elongate stolons, plantlets forming at the tips of the stolons, especially when in floating mats or in very soft substratum. Leaves linear-oblong to linear-lanceolate, acute to acuminate, 3-ribbed, somewhat succulent when fresh, 5–24 cm long, 3.5–20 mm wide, sometimes more. Raceme densely many-flowered (few-flowered in small specimens), 6–28 cm long, 2.5–3 cm across. Flowers small, greenish, with slender pedicellate ovaries 9–14 mm long. Dorsal sepal oval to suborbicular-ovate, mucronate, concave, 3–7 mm long, about 3 mm wide; lateral sepals ovate to ovate-oblong, mucronate, 4–7 mm long, about 3 mm wide. Petals bipartite; posterior division erect, falcate, oblong-lanceolate to lanceolate, acute, 3–7 mm long, anterior division filiform, falcate, erect, 4–7.5 mm long. Lip tripartite to within 2 mm of the base, strongly reflexed; lateral divisions filiform, 5–11 mm long; middle division linear to linear-oblong, 4–7 mm long. Spur slender, about as long as the pedicellate ovary.

Marshy shores of lakes, ponds, and streams, wet meadows, quaking bogs, fresh-water marshes, ditches and canals, in floating mats of vegetation. Coastal plain, N.C. to s. Fla., w. to Tex.; W.I., e. and s. Mex., C.Am., n. S.Am.

8. Habenaria blephariglottis (Willd.) Hook. WHITE FRINGED ORCHID. Fig. 367

Plant relatively stout, leafy below, bracted above, 0.8–11 dm tall. Stem strongly ribbed. Leaves ovate-lanceolate to elliptic-lanceolate or linear-lanceolate, acute to acuminate, 5–35 cm long, 1–5 cm wide. Raceme densely or laxly flowered, 3–20 cm long, 2.5–8 cm across. Flowers white, often tinged with cream color, with slender pedicellate ovaries about 2 cm long. Dorsal sepal oblong-elliptic to orbicular, obtuse to rounded at the apex, concave, 5–10 mm long, 4–8 mm wide; lateral sepals broadly ovate-orbicular, oblique, 5–11 mm long, 4–9 mm wide. Petals linear to narrowly oblong-spatulate or oblanceolate, truncate and retuse to denticulate at the apex, 3–8 mm long, 1–3 mm wide above. Lip with the undivided portion tonguelike, ovate-oblong to oblong-elliptic or oblong-quadrate, rarely suborbicular, 4–13 mm long, 2–4 mm wide, copiously and coarsely fringed; fringes less than 8 mm long, with the segments often branched. Spur slender, as long as or longer than the pedicellate ovary. (*Blephariglottis blephariglottis* (Willd.) Rydb.; *Platanthera blephariglottis* (Willd.) Lindl.; incl. *Blephariglottis conspicua* (Nash) Small)

Marshes, meadows, boggy zone between pocosins or branch bays and pine-scrub oak hills or ridges, depressions in pine savannas and flatwoods, prairies. Nfld. and Ont. to Mich., s. to Ohio, Va., thence coastal plain to cen. pen. Fla. and s.e. Tex.

9. Habenaria cristata (Michx.) R. Br. in Ait. CRESTED FRINGED ORCHID. Fig. 368

Plant leafy below, bracted above, 1.8–9 dm tall. Leaves oblong-lanceolate to linear-

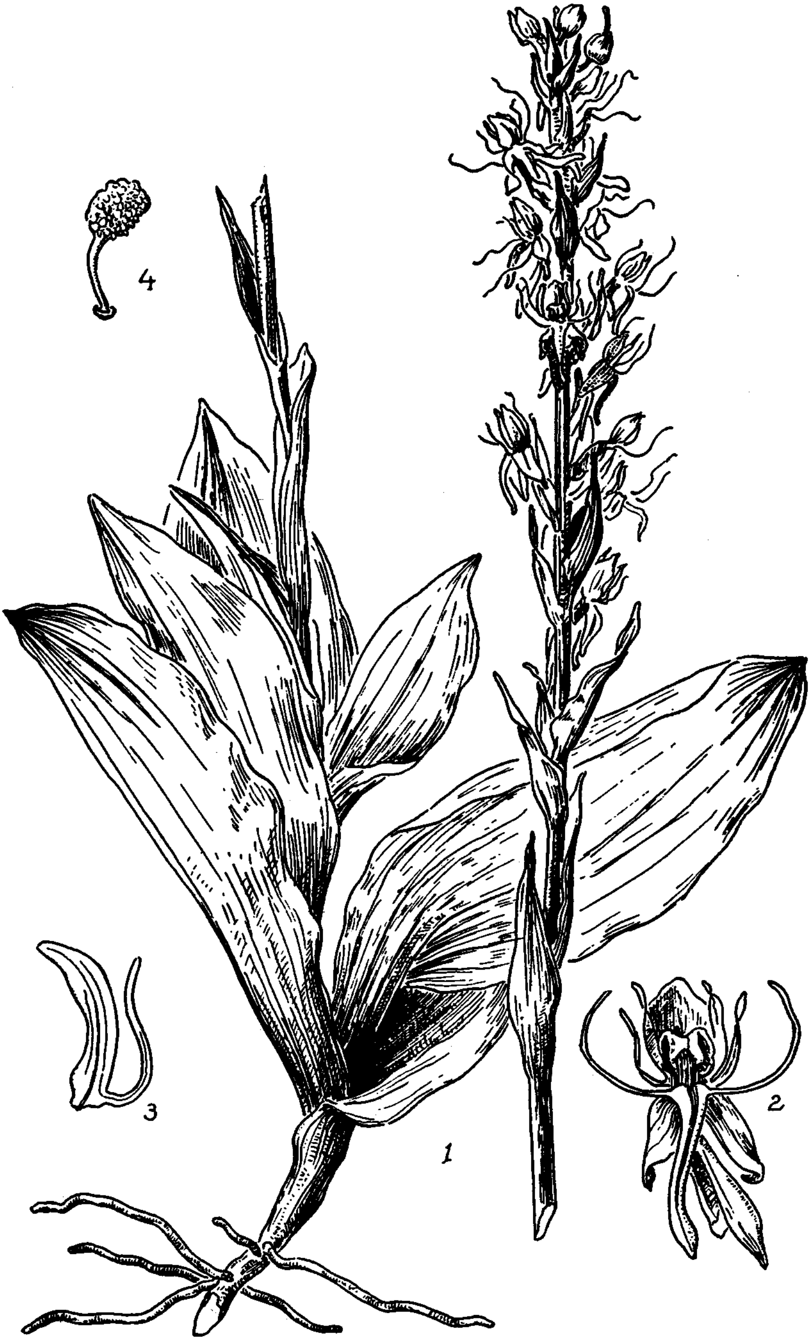

Fig. 365. **Habenaria distans:** 1, plant; 2, flower, front view; 3, petal; 4, pollen mass, highly magnified.

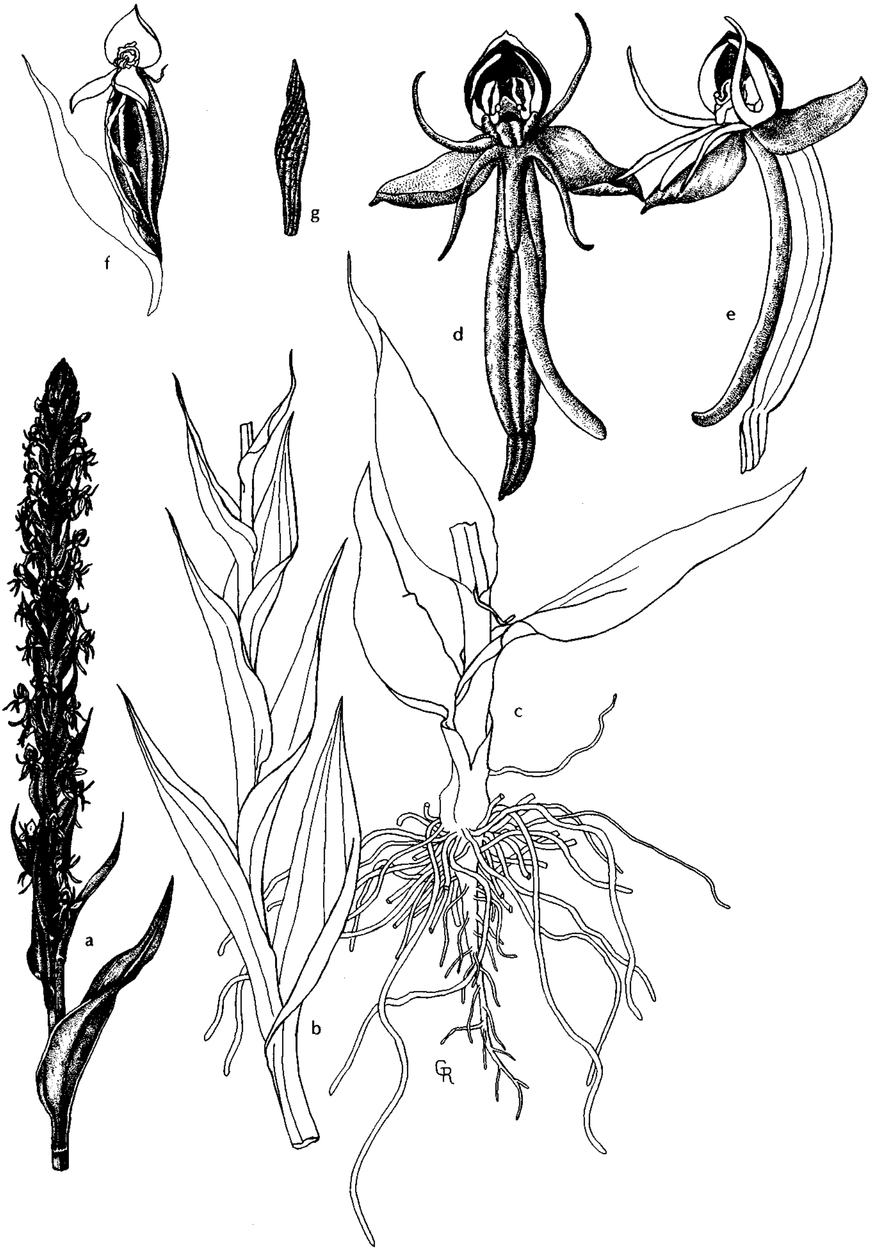

Fig. 366. **Habenaria repens:** a, inflorescence; b, center section of plant; c, basal portion of plant; d–e, two views of flower; f, capsule; g, seed.

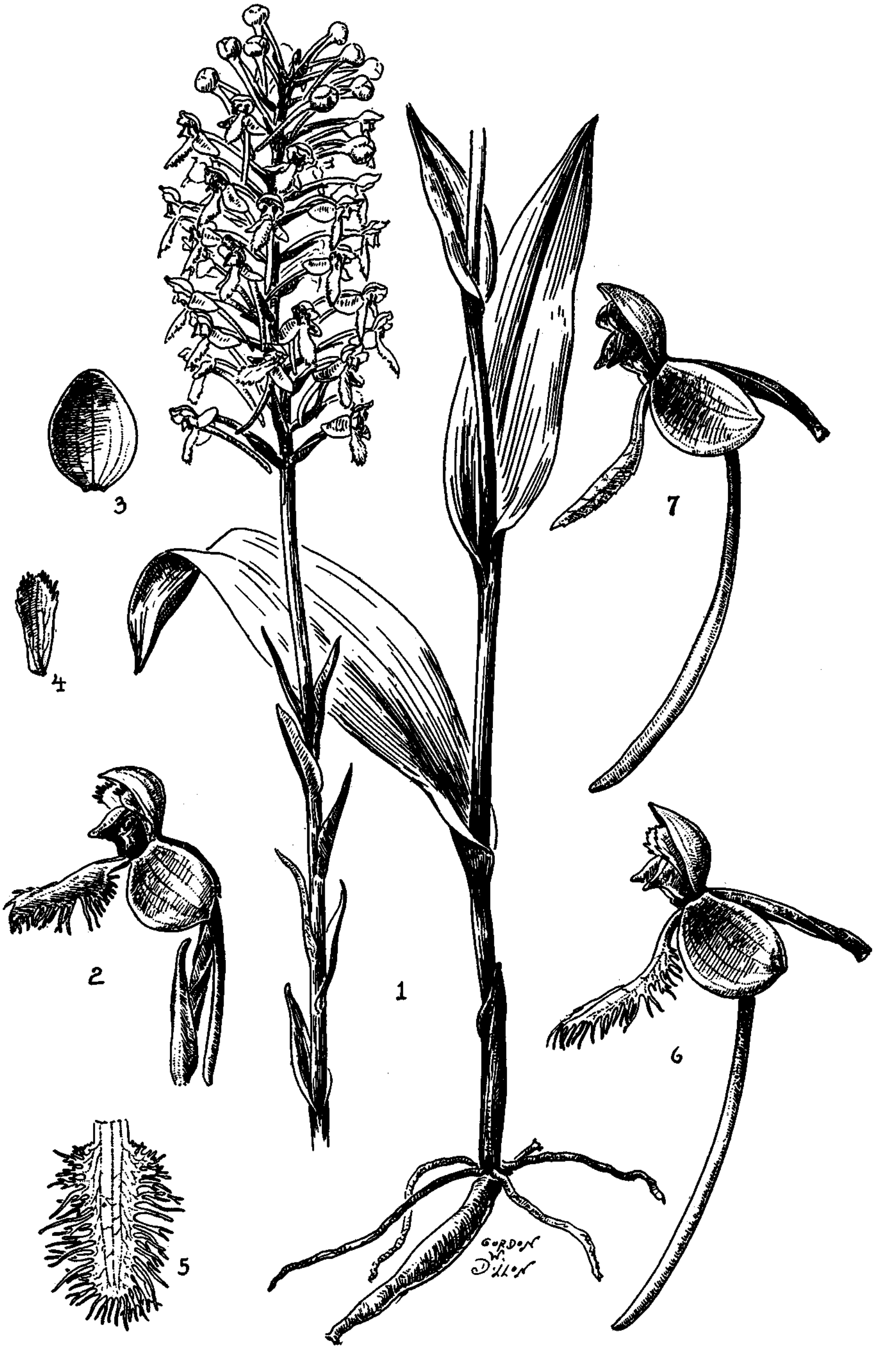
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Fig. 367. **Habenaria blephariglottis:** 1, plant; 2, flower, side view (more northern variant); 3, dorsal sepal; 4, petal; 5, lip, spread out; 6, flower, side view (more southern variant); 7, flower, side view (occasional variant).

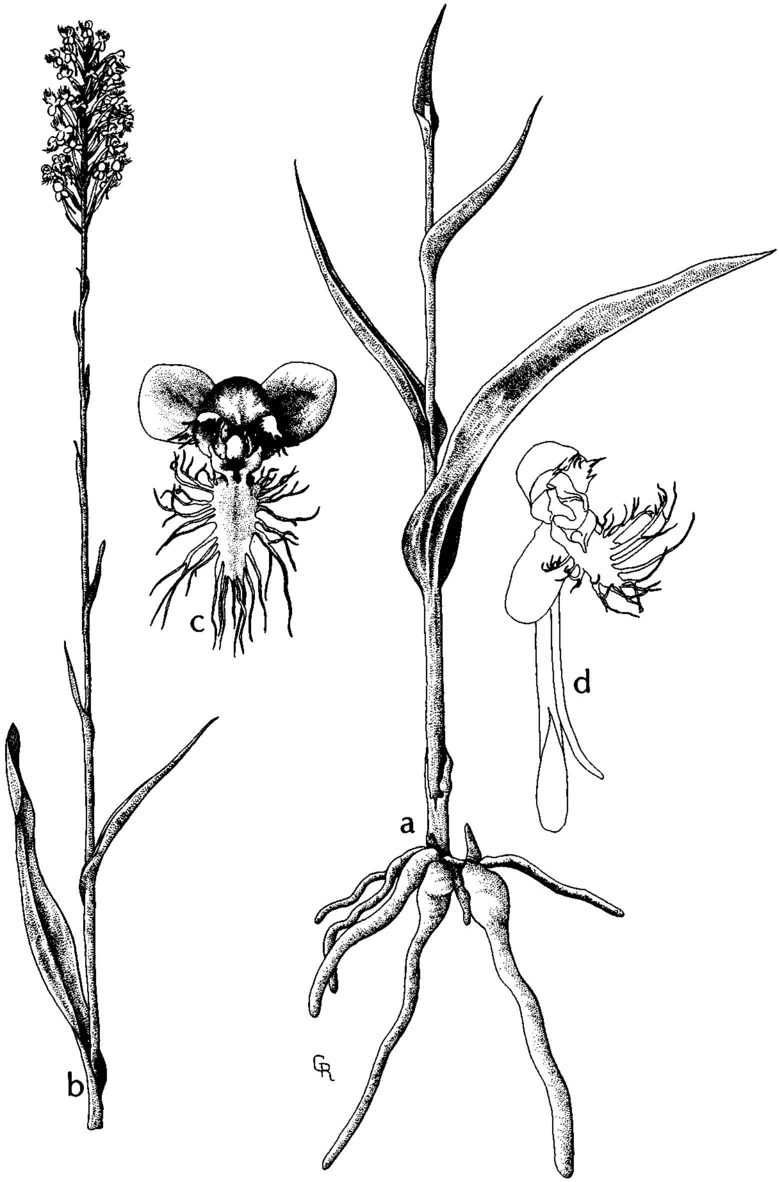

Fig. 368. **Habenaria cristata:** a–b, lower and upper portions of plant; c–d, flower (two views).

lanceolate, acute to acuminate, 7–21 cm long, 1–2.5 cm wide. Raceme cylindrical, densely flowered, 2–15 cm long, 2–4 cm across. Flowers bright orange, with slender pedicellate ovaries 1.2–1.7 cm long. Dorsal sepal oblong-elliptic to suborbicular, often slightly notched at the obtuse apex, concave, 3–5 mm long, 2–3 mm wide; lateral sepals suborbicular to orbicular, rounded at the apex, 3–4 mm long; 2–3 mm wide. Petals oblong-elliptic, often narrowly cuneate, fringed at the apex, 2–4 mm long, 1–2 mm wide. Lip ovate to ovate-oblong, 4–6 mm long, copiously ciliate-fringed, with the segments usually branched. Spur 5–10 mm long, slender, much shorter than the pedicellate ovary. (*Blephariglottis cristata* (Michx.) Raf.; *Platanthera cristata* (Michx.) Lindl.)

Sphagnum and sedge bogs, meadows, pine savannas and flatwoods, boggy soil of prairies, along streams in woods, borders of cypress swamps and depressions, seepage slopes. E. Mass. to cen. Fla., w. to e. and s.e. Tex., Ark., Tenn.

A hybrid, *H.* × *chapmanii* (Small) Ames (*Blephariglottis chapmannii* Small), (the putative parents, *H. cristata* and *H. blephariglottis*), with lemon yellow to orange flowers, intermediate in size between those of its parents, occurs from N.J. and Del. to n. Fla., w. to Tex.

10. Habenaria ciliaris (L.) R. Br. in Ait. YELLOW FRINGED ORCHID. Fig. 369

Plant leafy below, bracted above, 2.4–10 dm tall. Leaves oblong-lanceolate to lanceolate, acuminate, 7–30 cm long, 0.6–6 cm wide. Raceme densely or laxly flowered, 3.5–20 cm long, 4–8 cm across. Flowers bright yellow or deep orange, with slender pedicellate ovaries about 2 cm long. Dorsal sepal oblong-elliptic to orbicular, rarely notched or bidentate at the broad apex, concave, 4–9 mm long, about 4 mm wide; lateral sepals broadly ovate to suborbicular, abruptly obtuse, oblique, 6–9 mm long, 5–8 mm wide. Petals linear-oblong to linear-cuneate, acute and toothed at the apex, 6–7 mm long, 1–2 mm wide. Lip with the undivided portion linear-oblong to linear-cuneate, 8–12 mm long, 2–3 mm wide, copiously ciliate-fringed (the basal segments often branched) with the fringes usually 1 cm or more long. Spur slender, longer than the pedicellate ovary. (*Blephariglottis ciliaris* (L.) Rydb.; *Platanthera ciliaris* (L.) Lindl.)

Sphagnum and sedge bogs, swamps, marshes, thickets on borders of streams and ponds, low, wet pine savannas and flatwoods, swampy floodplain forests, wet meadows, prairies, pocosins, in deep humus of upland forests. Ont. to cen. pen. Fla., w. to s. Mich.; Ill., s.e. Mo., e. Ark., e. and s.e. Tex.

11. Habenaria integra (Nutt.) Spreng. YELLOW FRINGELESS ORCHID. Fig. 370

Plant with several leaves below and bracted above, 3–6 dm tall. Stem angled. Leaves oblong-lanceolate to narrowly lanceolate, acuminate, 10–19 cm long, 1–3 cm wide or more. Raceme densely many-flowered, cylindrical, 2–10.5 cm long, 2–3 cm across. Flowers light lemon-orange to dull orange, with stout pedicellate ovaries 5–10 mm long. Dorsal sepal suborbicular to orbicular, rarely toothed at the rounded apex, concave, 3–4 mm long, 2–3 mm wide; lateral sepals ovate-orbicular, subobtuse, oblique, 4–5 mm long, 3–4 mm wide. Petals narrowly oblong, obtuse, 3–4 mm long, about 2 mm wide. Lip ovate-elliptic to obovate, obtuse to acute, crenulate to rarely entire on the margins, 4–5 mm long, 3–4 mm wide. Spur descending, tapering from a thickened base, about 5 mm long. (*Gymnadeniopsis integra* (Nutt.) Rydb.; *Platanthera integra* (Nutt.) Gray ex Beck.)

Acid swamps, boggy depressions in pine savannas, flatwoods and prairies, swampy meadows. Coastal plain, s. N.J. to n. cen. Fla., w. to Tex.; mts. of N.C.; e. and cen. Tenn.

12. Habenaria nivea (Nutt.) Spreng. SNOWY ORCHID. Fig. 371

Plant with slender, erect, rigid stem. Leaves 2–3 near the base of the stem, rigidly suberect, linear to linear-lanceolate, long-acuminate, strongly keeled, 7–26 cm long, about 8 mm wide near the base, reduced above to slender acuminate bracts. Raceme many-flowered, cylindric, conical at the apex, slender, 3–15 cm long, 1.3–3 cm across.

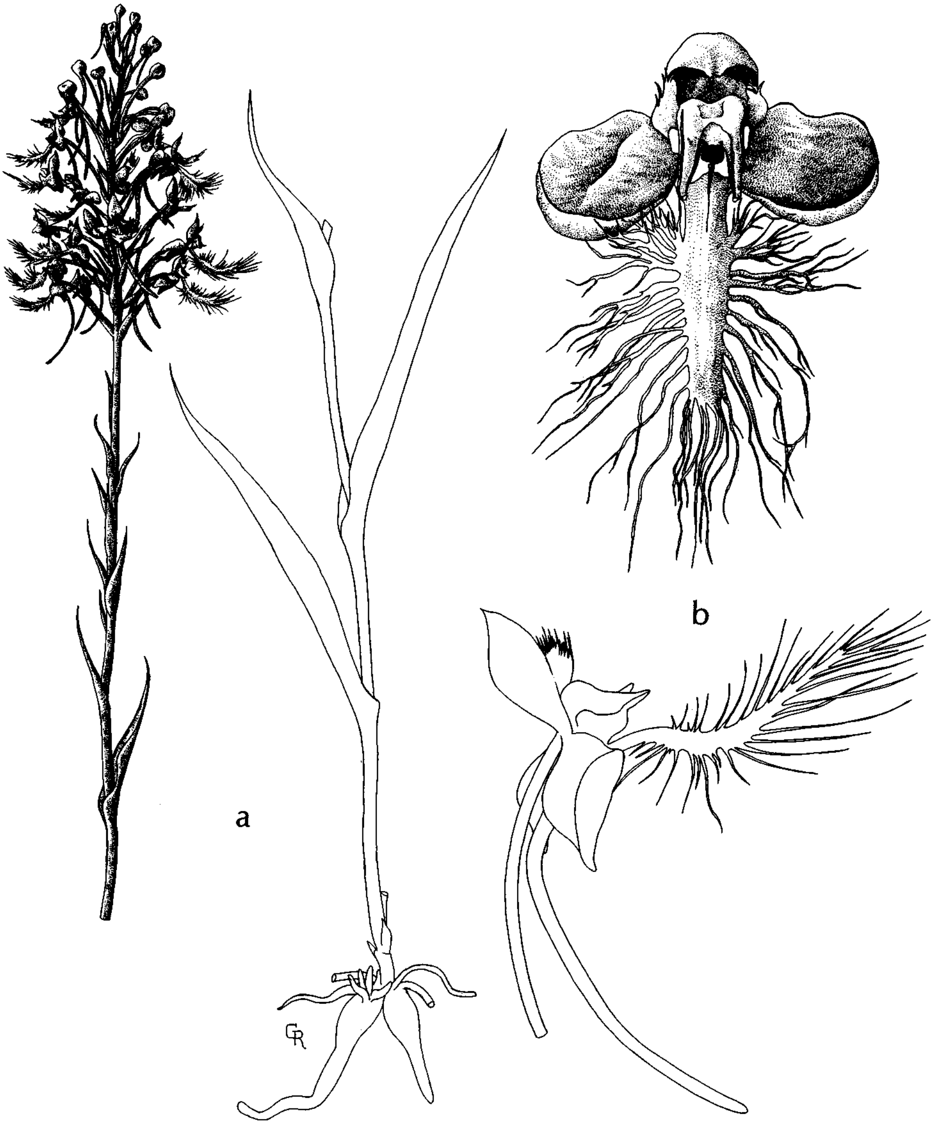

Fig. 369. **Habenaria ciliaris:** a, lower and upper portions of plant; b, flower (two views).

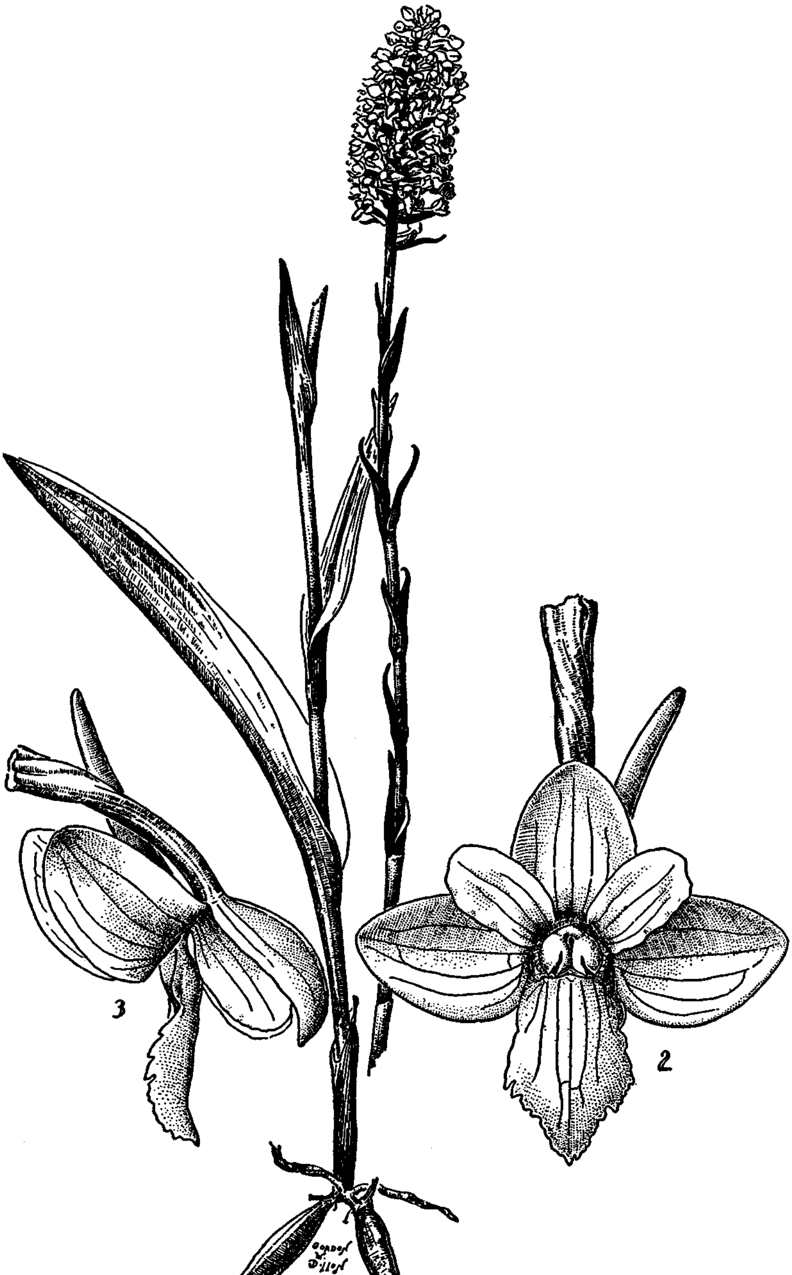

Fig. 370. **Habenaria integra:** 1, plant; 2, flower, front view, spread open; 3, flower, side view.

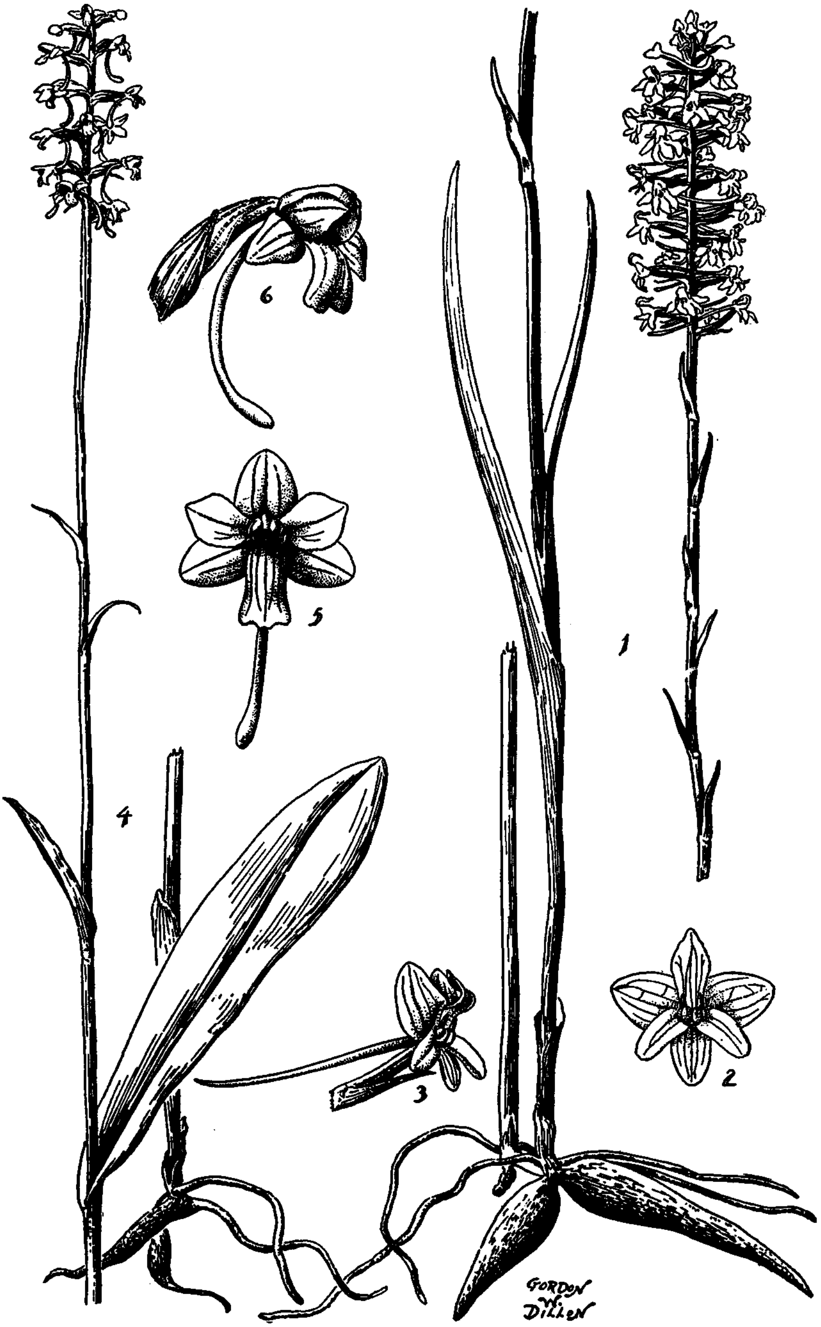
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Fig. 371. 1–3, **Habenaria nivea:** 1, plant; 2, flower, front view, spread out; 3, flower, side view; 4–6, **Habenaria clavellata:** 4, plant; 5, flower, front view, spread open; 6, flower, side view.

Flowers snowy-white, rarely tinged with pink, with slender pedicellate ovaries about 8 mm long. Dorsal sepal oval-oblong to suborbicular, obtuse, 2–5 mm long, 1–4 mm wide; lateral sepals ovate-oblong to oblong-elliptic, auriculate or dilated at the base of the posterior margin, obtuse, 4–6 mm long, 2–4 mm wide. Petals linear-oblong to elliptic, obtuse, somewhat falcate, 2–5 mm long, 1–2 mm wide. Lip uppermost, linear-oblong to linear-elliptic, often somewhat contracted at the apex, 3–8 mm long, 1–3 mm wide. Spur slender rarely clavellate, almost horizontally extended, curved upward, 1–1.6 cm long. (*Gymnadeniopsis nivea* (Nutt.) Rydb.; *Platanthera nivea* (Nutt.) Luer)

In wet pine savannas and flatwoods, wet prairies, bogs. Coastal plain, s. N.J. and Del. to s. Fla., w. to s.e. Tex., s.e. Ark.

13. **Habenaria flava** (L.) R. Br. SOUTHERN REIN ORCHID. Fig. 372

Plant slender to stoutish, 1–6 dm tall. Leaves 2–3, usually 2, near the middle of the stem or toward the base, oblong-elliptic to narrowly lanceolate, subobtuse to acuminate and attenuate, 5–20 cm long, 1–5 cm wide. Raceme usually densely flowered, sometimes laxly flowered, cylindrical, 6–20 cm long, 1.2–2 cm across. Flowers yellow-green, small, with stout pedicellate ovaries 5–10 mm long. Dorsal sepal ovate-oval, obtuse, 3–4 mm long, about 1.5 mm wide; lateral sepals ovate-oblong to suborbicular, obtuse, 2–4 mm long, about 1.5 wide. Petals ovate to oblong to suborbicular, rarely subquadrate, oblique, broadly rounded to obtuse at the apex, often crenulate on the margins, 2–5 mm long, 1.5–3.5 mm wide. Lip very variable in shape, broadly oblong to suborbicular, hastate to subhastate or entire, often with the margins undulate-crenulate, broadly rounded to truncate, occasionally retuse at the apex, strongly arcuate-decurved in natural position, adorned with a tubercle on the median line at or near the base, 2.2–6 mm long, 2–4.5 mm wide across the basal lateral teeth or lobules (when these are present). Spur slender, rarely clavellate, 4–11 mm long. (*Perularia flava* (L.) Farw.; *P. scutellata* (Nutt.) Small; *P. bidentata* (Ell.) Small; *Platanthera flava* (L.) Lindl.)

In mud and on rotting logs, floodplain swamplands, wet thickets, meadows, swales. Primarily coastal plain, Md., s. to cen. Fla., w. to s.e. Tex., e. Ark., e. Mo., s. Ill., s. Ind., w. Tenn., w. Ky.

14. **Habenaria strictissima** Reichb. f. var. **odontopetala** (Reichb. f.) L.O. Wms. Fig. 373

Plant 2.5–8.5 dm tall. Stem usually very leafy. Leaves 4–9, scattered alternately along the stem or rarely aggregated near the base of the stem, linear-elliptic to linear-lanceolate, acute to acuminate, 7–17 cm long, 2–4.5 cm wide. Raceme open and laxly flowered, 9–40 cm long, 3–6 cm across. Flowers yellowish green, with slender pedicellate ovaries about 2 cm long. Dorsal sepal oblong-elliptic, deeply concave or cucullate, forming a hood over the column, 4–7 mm long, 4–5 mm wide when spread out; lateral sepals ovate-oblong, oblique, obtuse, 5.5–8.5 mm long, 4–5 mm wide. Petals oblong-quadrate to linear-oblong, auriculate at the base on the anterior margin, conical-obtuse to sinuately 3-lobed at the apex, 3–5 mm long, 1–2 mm wide. Lip slender, linear, pendent, obtuse to rounded at the apex, slightly auricled or lobed on each side at the base, recurved toward the apex, 6–12 mm long, 3–4 mm wide at the base, about 2 mm wide near the middle. Spur slender, as long as or a little longer than the pedicellate ovary. (*Habenella odontopetala* (Reichb. f.) Small)

Wet rich soil of deeply shaded woods and hammocks, mucky soil of cypress swamps and swampy woods, along ditches and on rotten wood, rarely in scrub hammocks and dry sandy woods. E. Fla., southward in Fla.; s. Mex., C.Am., Cuba, P.R.

15. **Habenaria clavellata** (Michx.) Spreng. GREEN REIN ORCHID, SMALL WOOD ORCHID. Fig. 371

Plant usually relatively small, 0.8–4.5 dm tall. Stem somewhat angled and narrowly winged. Leaves one or rarely two, about at the middle of the stem, obovate-oblanceolate to narrowly oblanceolate, obtuse, 5–18 cm long, 1–3.5 cm wide, reduced above to linear-

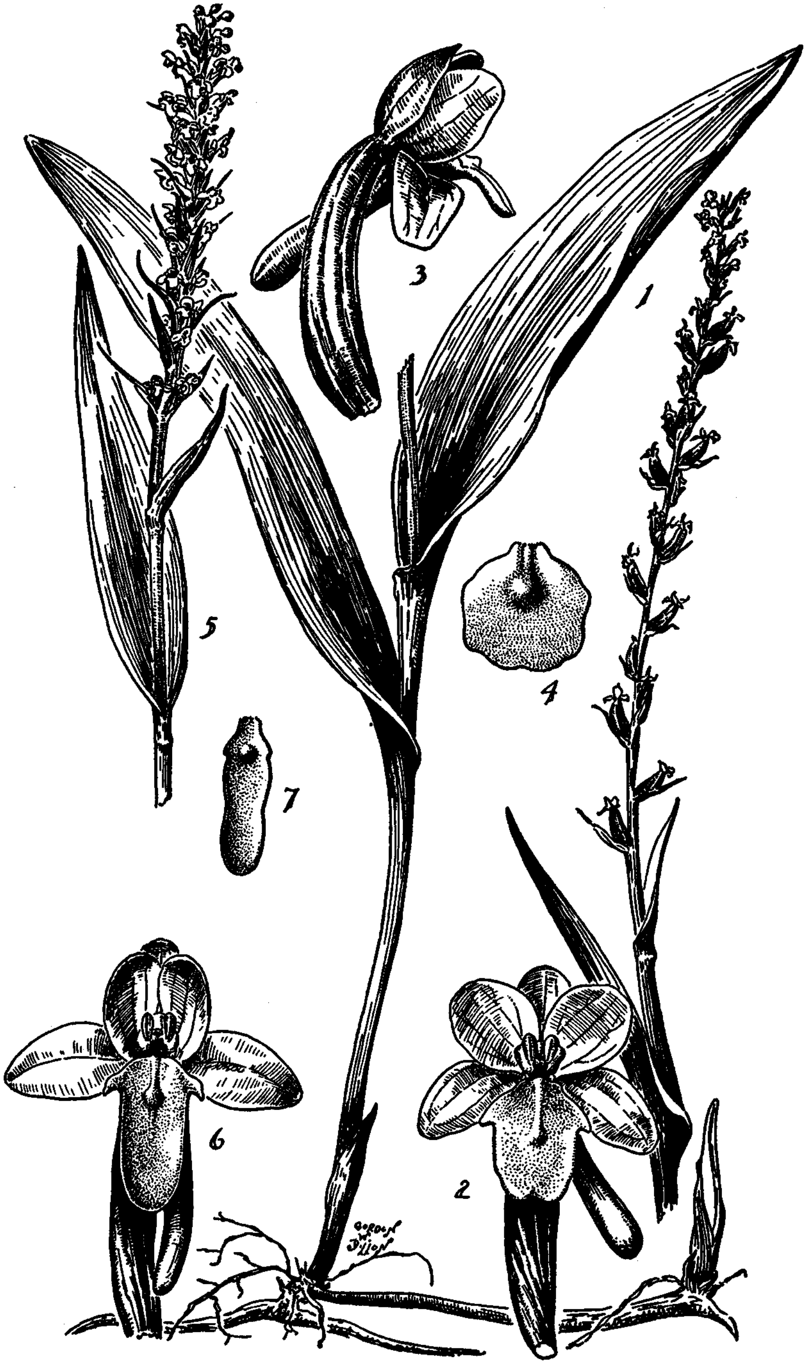
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Fig. 372. 1–4, **Habenaria flava:** 1, plant; 2, flower, front view, spread open; 3, flower, side view; 4, lip, an entire toothless form; 5–7, **Habenaria flava** *var.* **herbiola:** 5, inflorescence; 6, flower, front view; 7, lip, an unusual entire form.

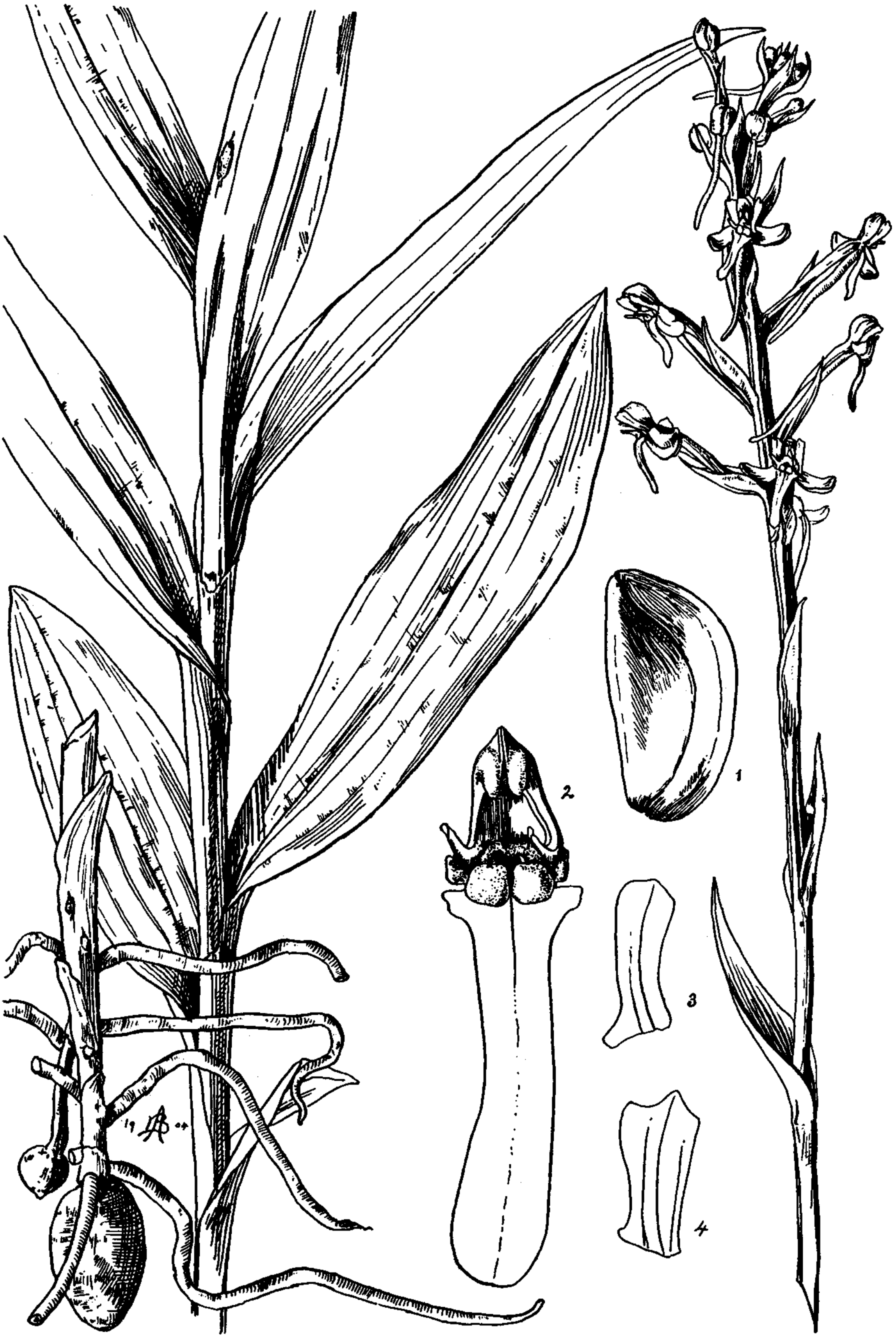

Fig. 373. **Habenaria strictissima** *var.* **odontopetala:** portions of plant (to left and right); 1, lateral sepal; 2, lip and column, front view; 3–4, two types of petals.

lanceolate bracts. Raceme few–many flowered, 2–9 cm long, 2–3.5 cm across. Flowers greenish or yellowish white, with stout spreading pedicellate ovaries about 1 cm long. Sepals ovate, rounded to obtuse at the apex, 4–5 mm long, about 2.5 mm wide; lateral sepals oblique. Petals ovate, obtuse, irregularly sinuate along the apical margin, 3.5 mm long, about 2 mm wide. Lip narrowly oblong-cuneate, truncate and sinuately tridentate at the apex, 3–7 mm long, 3–4 mm wide at the apex. Spur longer than the pedicellate ovary, slender-clavate (rarely cleft at the apex), curved upward, 8–12 mm long. (*Gymnadeniopsis clavellata* (Michx.) Rydb.; *Platanthera clavellata* (Michx.) Luer)

In water or at edge of water along streams in forests, swamps, on wooded seepage slopes and in ravines. Nfld. to w. Ont., generally southward to n. Fla. and e. Tex.

2. Listera

Small, inconspicuous, terrestrial herbs with fibrous roots. Stems slender, more or less glandular-pubescent above the 2 opposite leaves. Leaves sessile, inserted about the middle of the stem. Inflorescence a terminal raceme composed of small greenish or purplish flowers. Sepals and petals free, similar and subequal; lip longer than the sepals and petals, bilobed or 2-cleft at the apex, variously toothed, auricled, lobed or sometimes entire on each side at the base; column wingless; stigmas with a rounded beak; anther borne on the back of the column near the apex; pollinia 2, powdery; capsule small, slender pedicellate.

- Lip obovate-cuneate, apical lobes rounded; leaves ovate-reniform. 1. *L. smallii*
- Lip linear-oblong, apical lobes linear; leaves ovate, ovate-oblong or elliptic. 2. *L. australis*

1. Listera smallii Wieg. APPLACHIAN TWAYBLADE, KIDNEY-LEAF TWAYBLADE.

Leaves ovate-reniform, 2–4 cm long, 1.5–3.5 cm wide, acute, mucronate or apiculate to short-acuminate. Raceme laxly few-flowered, flowers yellowish to whitish green. Sepals and petals lanceolate or linear-lanceolate, 3–4 mm long, acute. Lip sessile, widely obovate to cuneate, dilated and deeply cleft apically into a pair of divergent widely rounded lobes, shallowly toothed in the sinus, with a short recurved tooth on each side near the base.

Moist wooded mountain slopes, moist humus in deep woods, damp shaded thickets, sometimes in wooded sphagnum bogs. Pa., Va., W.Va., mts. of N.C., S.C., Tenn.

2. Listera australis Lindl. SOUTHERN TWAYBLADE. Fig. 374

Leaves ovate to ovate-oblong or elliptic, 1.3–4 cm long, 0.5–2.1 cm wide near the base, obtuse to apiculate, base often subcordate. Raceme open, few–many-flowered, flowers reddish purple. Sepals ovate to ovate-elliptic, less than 2 mm long and 1 mm wide, obtuse; petals oblong-quadrate, recurved, less than 1.5 mm long, about 1 mm wide. Lip sessile, linear, cleft or parted ⅓–¾ its length, 6–12 mm long, about 2 mm wide near the middle, with a small incurved basal auricle on each side and a slight ridge in the center near the base, apical lobes linear-attenuate, acuminate, separated by a minute tooth in the sinus.

Rich humus of low moist woods, ravines, in low pinelands, swampy woods, marshes, sphagnum bogs and thickets, often on the thick bases of cinnamon fern and royal fern. Que. and Ont. to cen. pen. Fla., w. to s.e. Tex.

3. Triphora

Triphora trianthophora (Sw.) Rydb. in Britt. THREE-BIRDS ORCHID. Fig. 375

Plant glabrous, 8–30 cm tall, stoloniferous, producing at the ends of the stolons waxy ovoid tubers to 3 cm long. Roots slender, whitish. Stems slender or stout, succulent, usually tinged with maroon, translucent in drying. Leaves bractlike, concave, clasping and partly sheathing the stem, scattered alternately along the stem, usually tinged and veined with maroon, widely ovate, 8–20 mm long, 5–13 mm wide, obtuse to short-acute.

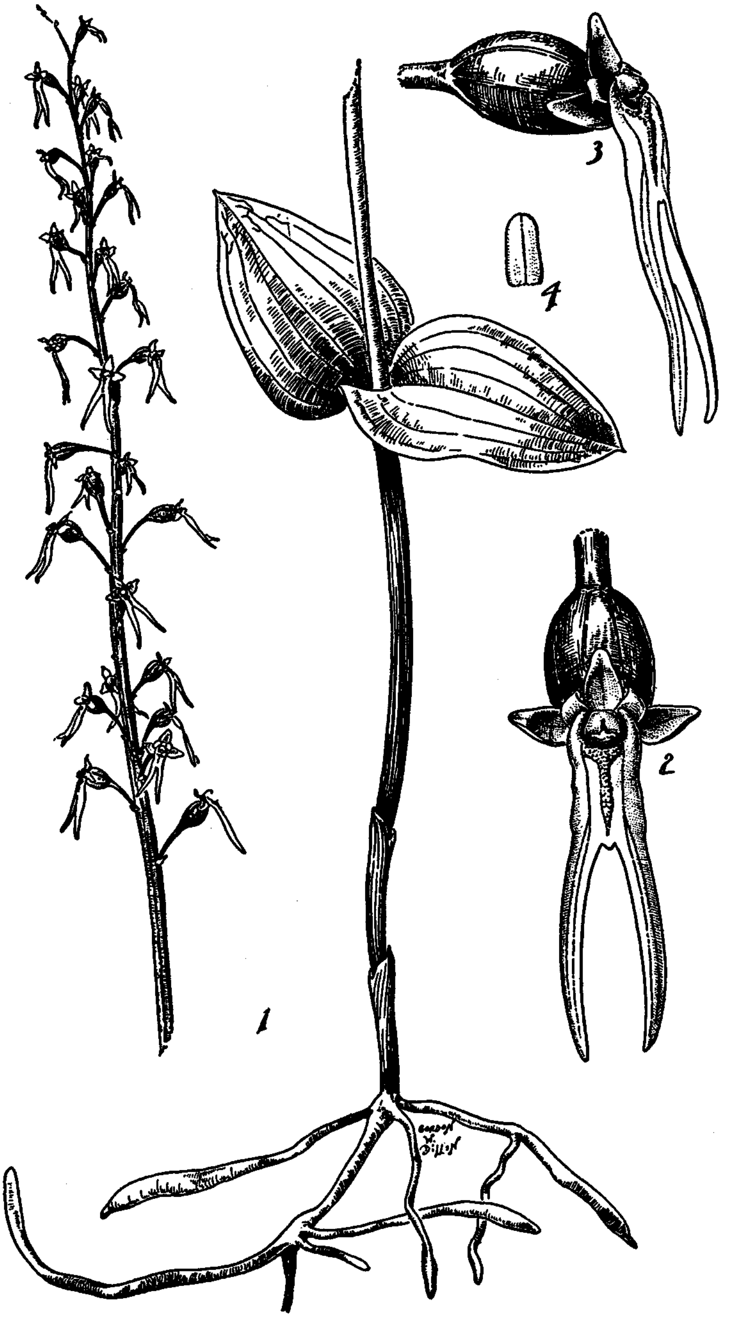
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Fig. 374. **Listera australis:** 1, plant; 2, flower, front view; 3, flower, side view; 4, petal.

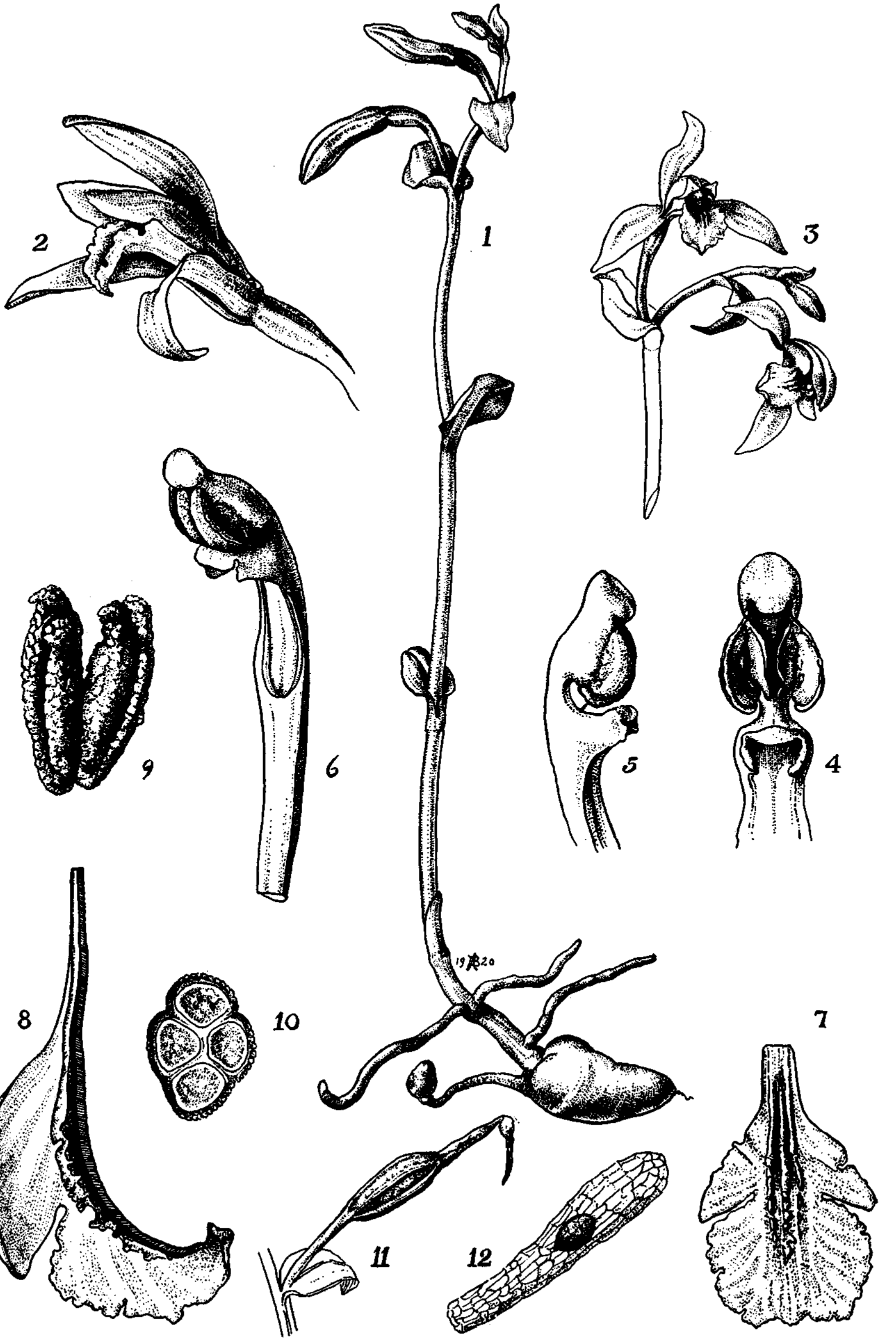

Fig. 375. **Triphora trianthophora:** 1, plant, in bud; 2, flower, side view; 3, flowers; 4, upper part of column, with pollinia removed; 5, upper part of column, side view; 6, column, side-front view; 7, lip, spread out; 8, longitudinal section through center of lip; 9, pollinia; 10, pollen tetrad, much magnified; 11, capsule; 12, seed.

Inflorescence of 1–6 (usually 3) flowers borne in the axils of the upper leaves. Flowers pale pink to almost white, veined or suffused with purple and green, nodding, gaping, lasting but a day. Sepals and petals elliptic to oblong-spatulate, 13–15 mm long, 4–5 mm wide, obtuse to acute. Lip 3-lobed, obovate in outline, 13–16 mm long, about 10 mm wide when spread out, narrowed to a slender claw, 3-keeled or crested on the median line of the disc with the keels broken into teeth or tubercles above.

On rotten logs and in rich humus and leaf mold of low hammocks, hardwood and coniferous forests, rich woods along streams, edges of swamps, floodplain forests, mountain slopes. Maine to Wis. and e. Iowa, generally southward to cen. pen. Fla. and e. Tex.

Four additional species of *Triphora,* in our range, occur in Florida and are of relatively rare occurrence there. See Luer, "The Native Orchids of Florida," New York Botanical Garden, 1972.

4. Isotria

Isotria verticillata (Muhl. ex Willd.) Raf. WHORLED POGONIA. Fig. 376

Erect, glabrous herb, 9–35 cm tall, propagating by means of root shoots. Roots long, fibrous, densely hairy. Stem purplish or reddish brown, glaucous, hollow. Leaves 5–6 in a whorl at the top of the stem, oblong-lanceolate to broadly obovate or elliptic, obtuse to acute or rarely short-acuminate apically, projecting at right angles to the stem, greenish above, somewhat glaucous beneath, 3–9.5 cm long, 2.5–5.2 cm wide, expanding noticeably as the capsule matures. Flowers 1 (rarely 2), terminating the stem, pale yellowish green and purple, gaping, on long pedicels. Sepals subequal, madder-purple, narrowly lanceolate, acuminate, 3.4–6 cm long, about 3 mm wide. Petals yellowish green, elliptic-obovate to elliptic-lanceolate, obtuse to acute, 2–2.5 cm long, about 5 mm wide. Lip yellowish green, streaked with purple, oblong-cuneate, 3-lobed near the apex, 1.5–2.5 cm long, about 1 cm wide, crested with a broad fleshy ridge (somewhat papillose above) along the middle of the disc; lateral lobes obtuse to subacute, involute and forming a shallow groove in natural position; midlobe transversely oblong-elliptic, truncate to retuse apically.

Dry to moist sandy pine woods, low rich damp hardwoods along streams, floodplain forests, tamarack swamps, shady ravines, boggy places in upland woods, mixed hardwood slopes. Maine to Mich., generally southward to s.w. Ga., Ark., and n.e. Tex.; Gadsden Co., Fla.

5. Pogonia

Pogonia ophioglossoides (L.) Ker-Gawl. ROSE POGONIA. Fig. 377

Plant slender, glabrous, forming rootshoots and stolons, 0.8–7 dm tall. Leaf solitary, about halfway up the stem (occasionally with one or two long-petiolate leaves arising from the base of the stem), ovate to elliptic or broadly ovate-lanceolate, obtuse to subacute, 2–12 cm long, 1–3 cm wide, rarely smaller. Flowers 1–3, usually 1, terminating the stem, rose to white, fragrant. Dorsal sepal oblong-elliptic to linear-oblong, subobtuse, 1.5–2.3 cm long, 3.6 mm wide; lateral sepals narrowly elliptic to linear-oblong or linear-lanceolate, acute to rarely obtuse, 1.5–2.7 cm long, 3–6 mm wide. Petals oblong-elliptic to elliptic-obovate, broadly rounded at the apex, 1.3–2.5 cm long, 5–11 mm wide. Lip narrowly oblong-spatulate, narrowed at the base, lacerate-toothed along the apical margin, prominently bearded along the three central veins of the disc with short fleshy yellow-white bristles, 1.5–2.5 cm long, 8–10 mm wide near the apex.

Sphagnous bogs, meadows, swamps, pine savannas and flatwoods, prairies. Nfld. to s. Ont. and Minn., s. in the East to s. Fla., Minn. to e. Tenn., southwestward to s.e. Tex.

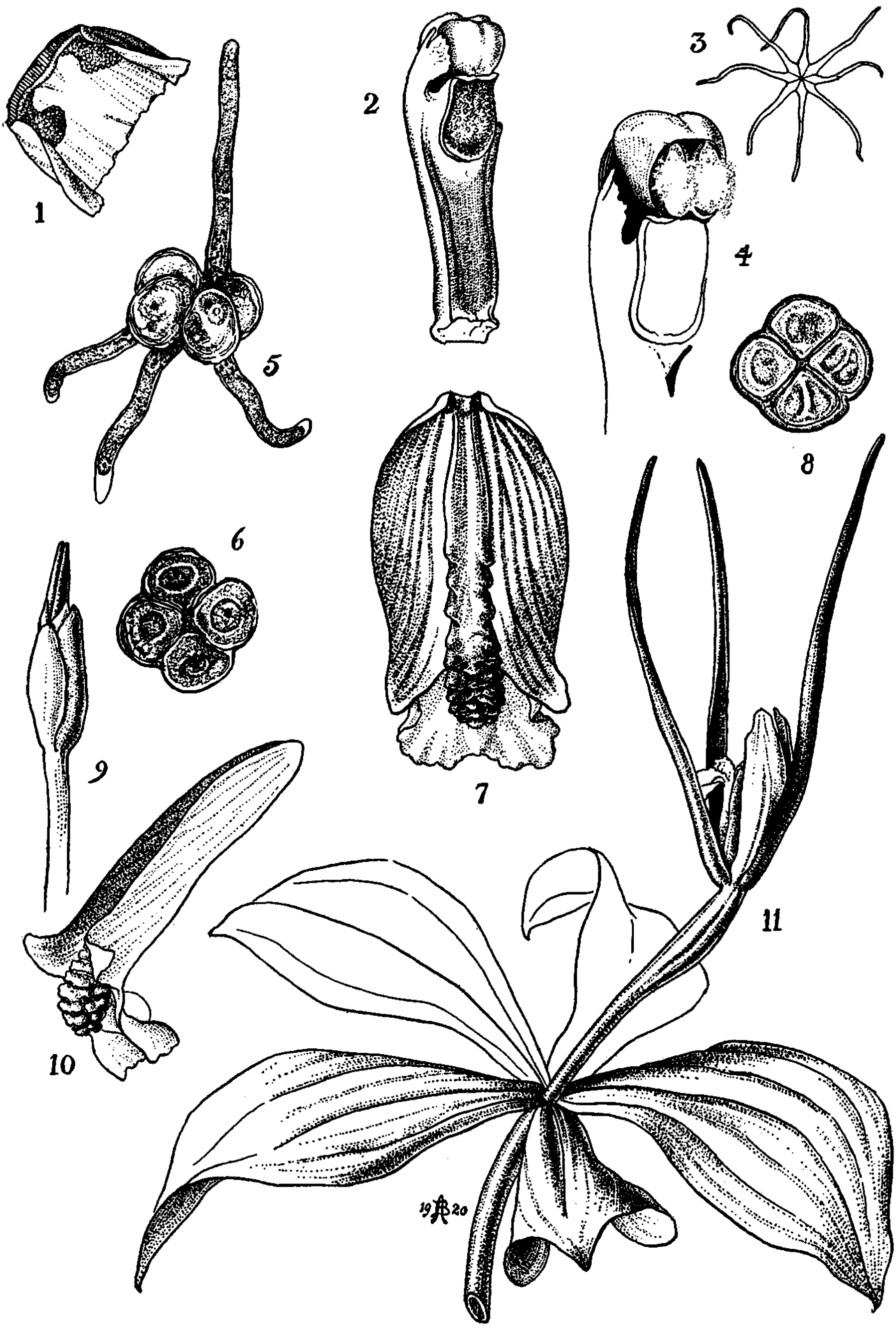

Fig. 376. **Isotria verticillata:** 1, base of lip, to show gland on each side; 2, column; 3, stellate trichome from lip; 4, upper part of column with anther turned back and mealy pollen exposed; 5, pollen tetrad, highly magnified, found germinating *in situ;* 6 and 8, pollen tetrad before germination; 7, lip, spread out; 9, flower bud invested with verticel of developing leaves; 10, lip, side view; 11, flower and leaves.

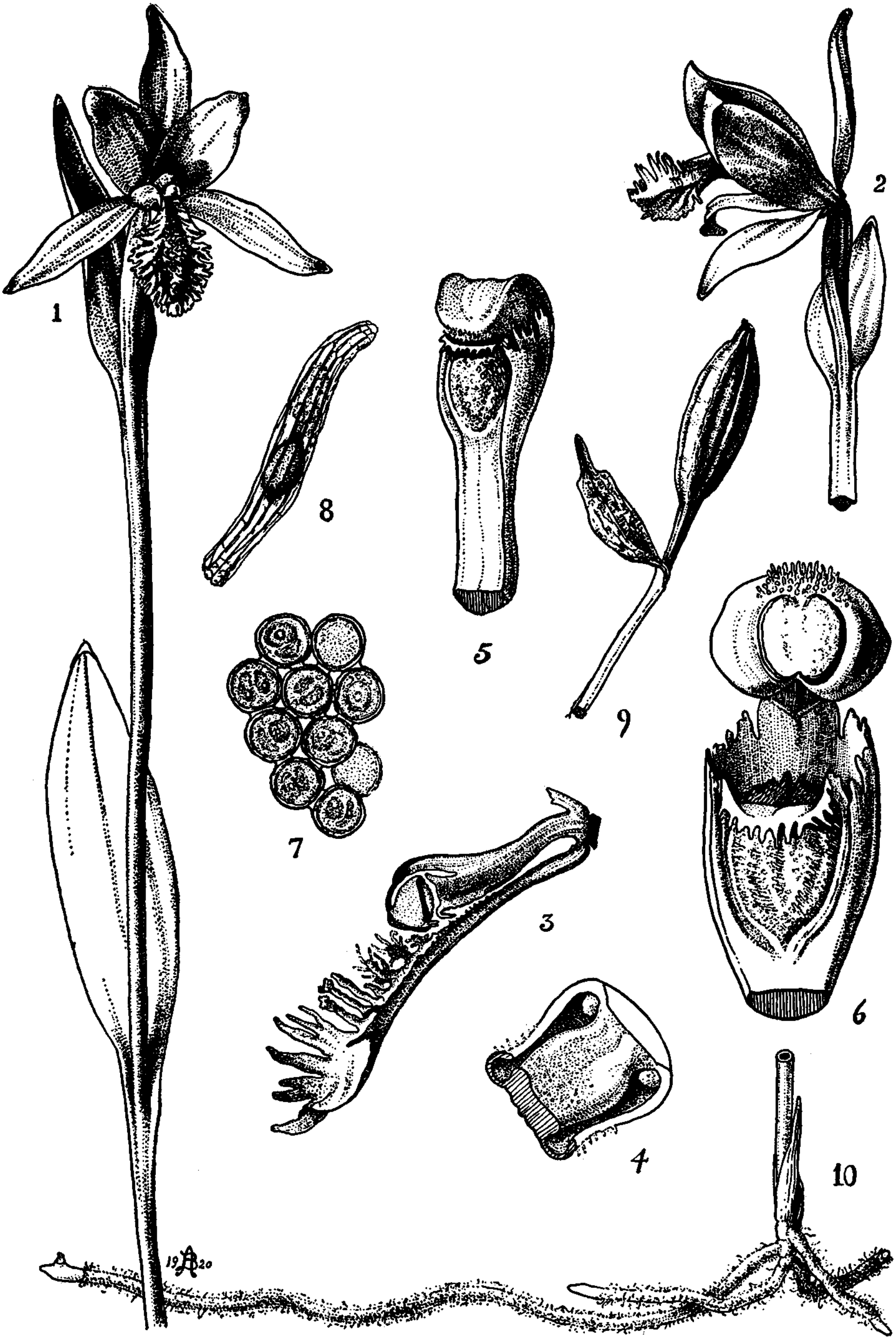

Fig. 377. **Pogonia ophioglossoides:** 1, upper part of plant; 2, flower, side view; 3, longitudinal section through center of lip and column, to show the structure of the median keel of the lip and position of the anther in relation to the clinandrium; 4, base of lip to show gland on each side; 5, column, with anther in normal position; 6, upper part of column, anther turned back; 7, ten pollen grains, highly magnified; 8, seed, highly magnified; 9, capsule; 10, base of stem.

6. Cleistes

Cleistes divaricata (L.) Ames. SPREADING POGONIA. Fig. 378

Plant glabrous, to 7.5 dm tall. Leaf solitary, inserted above the middle of the stem, oblong-lanceolate to elliptic-oblong, subobtuse to acuminate, glaucous, with a thin translucent margin, 3–20 cm long, 1–2 cm wide. Flowers one to rarely three terminating the stem, magenta-pink to white and brown or veined with brown, showy. Sepals similar, ascending, linear-lanceolate, acuminate, brownish or purple, 3–6.5 cm long, about 5 mm wide. Petals and lip connivent and forming a cylindrical tube; petals magenta-pink to white, spatulate-oblanceolate, acute, 2–4.5 cm long, 1–1.4 cm wide at or near the apex. Lip broadly oblong-cuneate, strongly veined, indistinctly 3-lobed, crenulate along the margins, with a linear-grooved somewhat fleshy papillose crest extending through the median line of the disc, 3.5–4.5 cm long, about 2 cm wide above the middle when expanded; lateral lobes broadly rounded, involute and forming a trough, apical lobe ovate-triangular, somewhat revolute and recurved in natural position, projecting about 1 cm beyond the lateral lobes.

Pine savannas and flatwoods, bogs, swamps and along stream banks. Del. to s. W.Va., e. Ky., e. Tenn., s. to n. pen. Fla., southwestward to s.e. Tex.

7. Arethusa

Arethusa bulbosa L. BOG-ROSE. Fig. 379

Plant glabrous, 0.6–4 dm tall, with 1 (–2) stems arising from a bulbous corm 0.5–1.5 cm across. Stem with 1–3 loose bracts below, a solitary leaf inserted just above the middle, developing as the capsule matures, grasslike, linear-lanceolate, 5–23 cm long, 3–12 mm wide, acute or rarely obtuse. Flower showy, 1 (rarely 2–3) terminating the stem, magenta-pink to white and brown or veined with brown. Sepals linear-lanceolate, brownish or purple, 3–6.5 cm long, about 5 mm wide, acuminate. Petals and lip connivent below and forming a cylindrical tube free above; petals magenta-pink to white, spatulate-oblanceolate, 2–4.5 cm long, 1–1.4 cm wide at or near the apex, acute. Lip strongly veined, indistinctly 3-lobed, widely oblong-cuneate, 3.5–4.5 cm long, about 2 cm wide above the middle when expanded, margins crenulate, with a linear-grooved, somewhat fleshy, papillose crest extending through the median line of the disc.

Sphagnous bogs, wet meadows, swamps, open swales. Nfld. to Minn., s. to N.J. and n. Ind., s. in the mts. and pied. to N.C.

8. Calopogon

Terrestrial scapose herbs arising from orbicular or ellipsoid corms, with a solitary (rarely more than one) grasslike leaf whose base sheaths the stem near its base. Inflorescence a few–several-flowered terminal raceme. Flowers conspicuous, showy, varying from white to deep crimson or magenta. Sepals and petals free, spreading. Lip forming the upper segment of the perianth, with a minute lateral lobe on each side near the base, strongly dilated and bearded above with numerous clavellate hairs and papillae at the apex. Anther terminal, operculate; pollinia 4, 2 in each anther cell, the grains connected by filaments.

1. Flowers opening successively up the raceme over a prolonged flowering period (thus if flowering is far enough advanced buds, flowers and fruits all on the raceme at the same time).
  2. Dorsal sepal (20–) 23–27 mm long. 1. *C. tuberosus*
  2. Dorsal sepal 13–18 mm long. 2. *C. pallidus*
1. Flowers opening almost simultaneously or in rapid succession.
  3. Petals widest below the middle. 3. *C. barbatus*
  3. Petals widest above the middle. 4. *C. multiflorus*

1. Calopogon tuberosus (L.) BSP. GRASS-PINK. Fig. 380

Plant variable in stature, 1–12 dm tall, slender to stoutish. Leaves 1, rarely 2, linear to

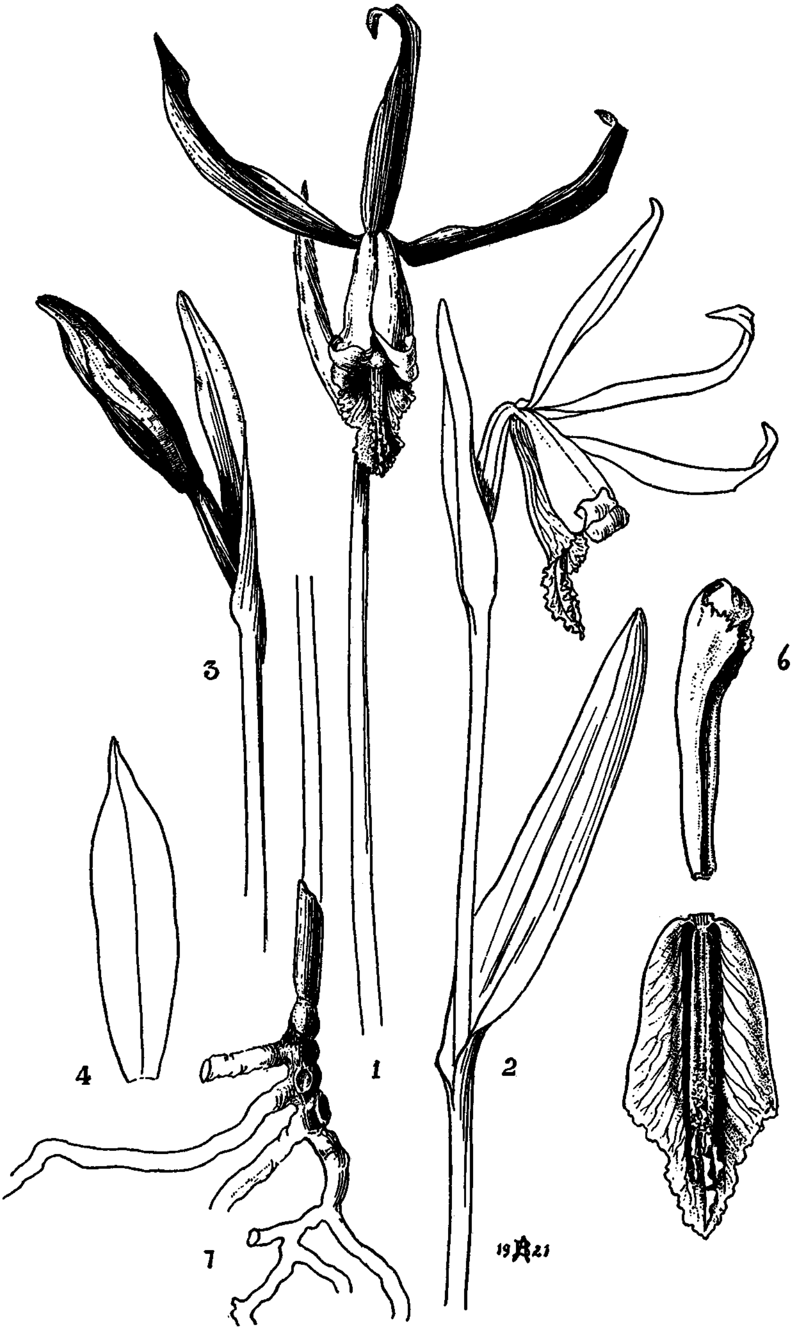
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Fig. 378. **Cleistes divaricata:** 1–2, plant; 3, flower bud; 4, petal; 5, lip, spread out; 6, column; 7, rhizome and roots.

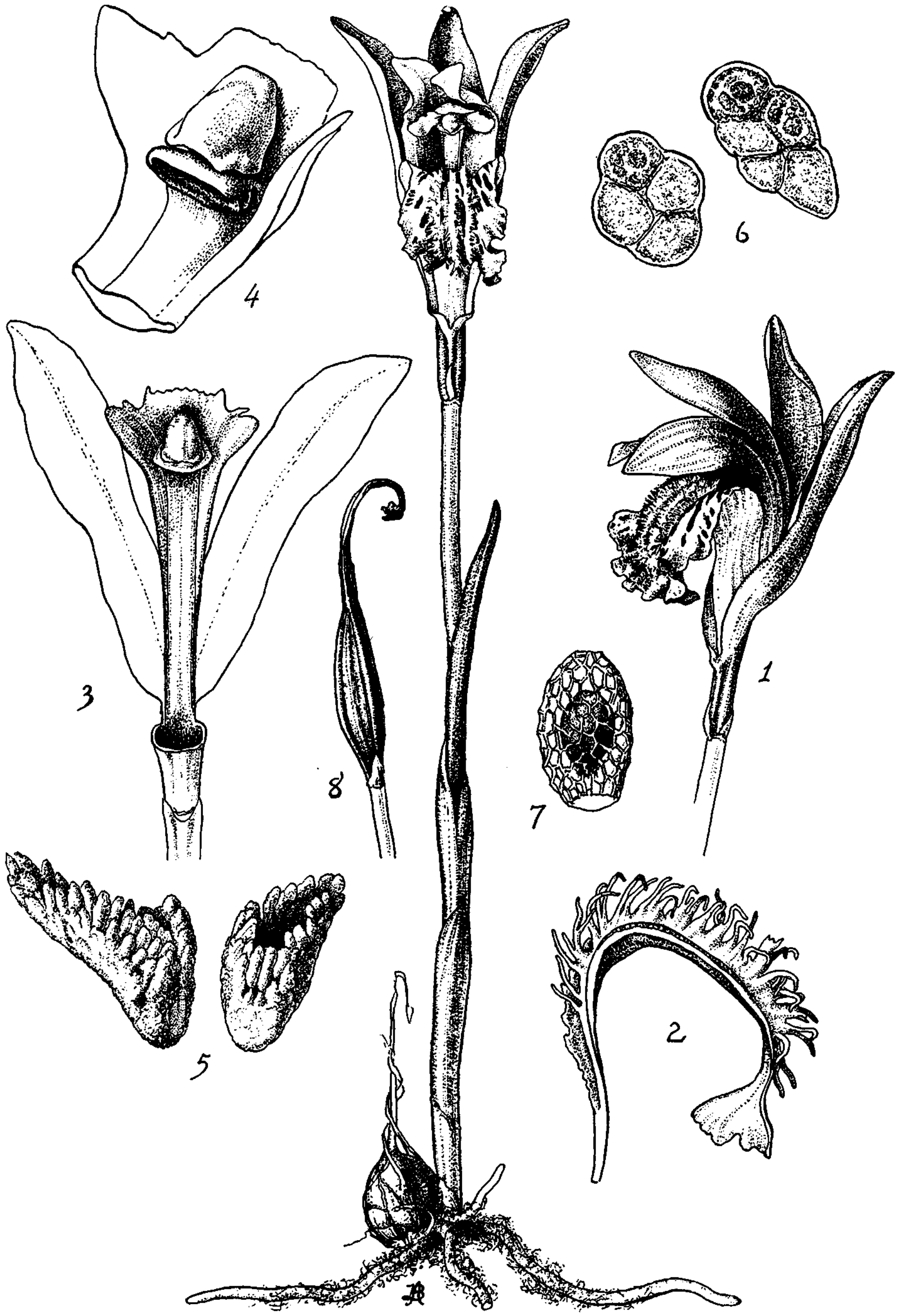

Fig. 379. **Arethusa bulbosa:** plant, (center); 1, flower, side-front view; 2, longitudinal section through lip, to show crest, side view; 3, column and petals, front view; 4, upper part of column, to show anther and stigma, front-side view; 6, pollen tetrads, highly magnified; 7, seed, highly magnified.

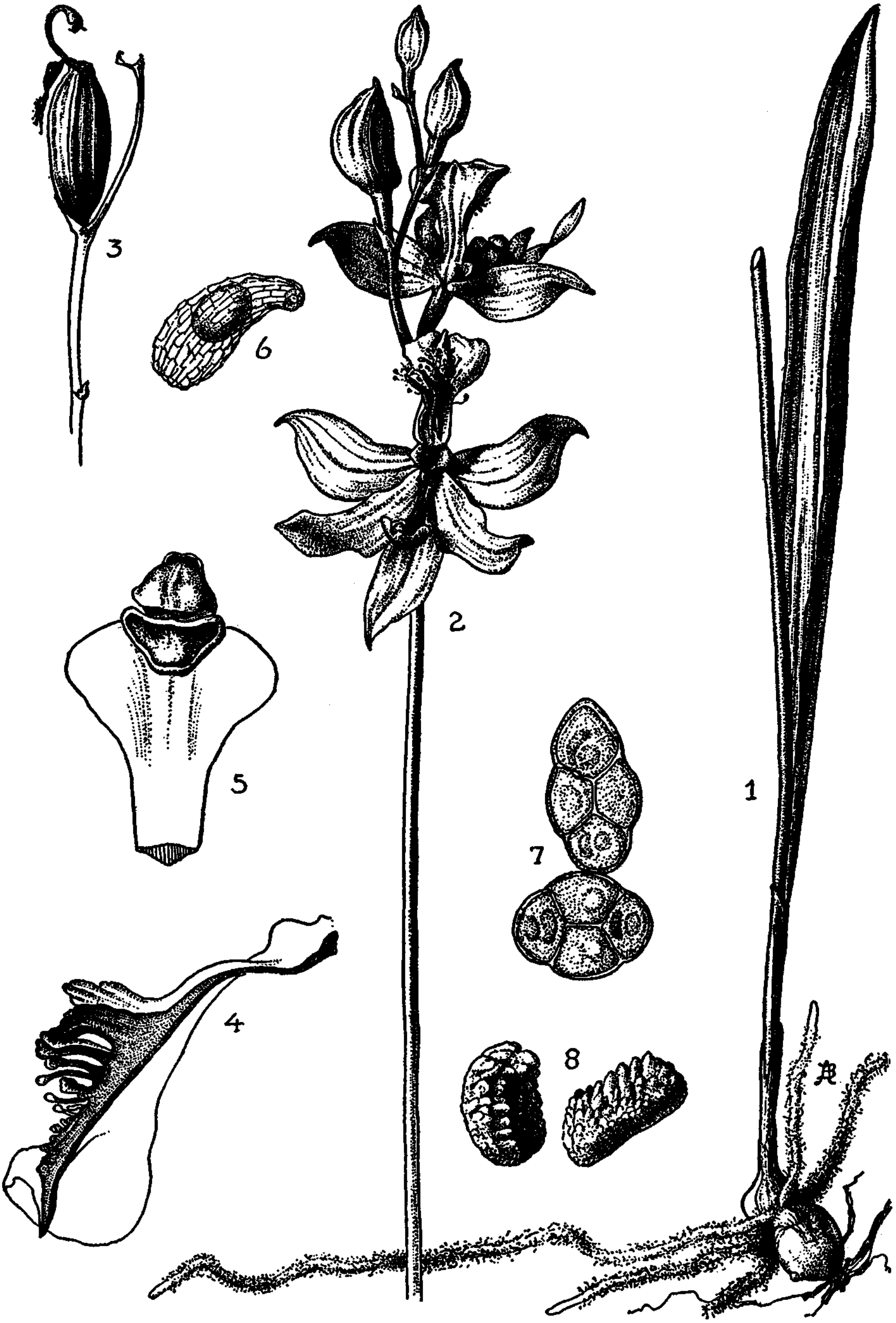

Fig. 380. **Calopogon tuberosus:** 1, basal part of plant; 2, inflorescence; 3, mature capsule, to show the persistent column; 4, longitudinal section through center of lip to show the papillae; 5, upper part of column; 6, seed, highly magnified; 7, two pollen tetrads, highly magnified; 8, pollen masses, highly magnified.

linear-lanceolate, occasionally semiterete or linear-setaceous, strongly ribbed, flat or keeled, up to 5 dm or more long and 5 cm wide. Raceme laxly flowered, 3–25 flowers opening successively up the raceme, pink to rose-purple, magenta-crimson, rarely white. Dorsal sepal narrowly oblong to oblong-elliptic, acute to apiculate, 2–2.7 cm long, 5.5–10 mm wide. Lateral sepals ovate to ovate-lanceolate or oblong-elliptic, oblique, abruptly acute, 1.2–2.3 cm long, 9–13 mm wide. Petals with a short claw, narrowly pandurate, oblong-pandurate, ovate-lanceolate or oblong-elliptic, usually somewhat constricted above the middle, widest near the base, broadly rounded to obtuse or rarely acute apically, 1.3–2.4 cm long, 4–9 mm wide below the middle. Lip 1–2 cm long, 7–10 mm wide; lateral lobes near the base inconspicuous, separated from the large midlobe by a gradually dilated isthmus, midlobe widely obovate to suborbicular, widely rounded or sometimes retuse apically, with broadly rounded lateral margins; disc bearded on the central portion with clavellate hairs; column widely winged on each side near the apex, 7–8 mm long; broadly winged on each side near the apex, 6–9 mm across the wings; pair of wings (when spread out) forming a suborbicular to rhombic or broadly obovate lamina. (*C. pulchellus* (Salisb.) R. Br.; *Limodorum tuberosum* L.)

Sphagnous bogs and swamps, marshes, low wet pine savannas and flatwoods, edges of swamps and cypress-gum ponds. Nfld. to Minn., generally southward to s. Fla., e. and s.e. Tex.; Cuba, Bah. Is.

2. Calopogon pallidus Chapm. PALE GRASS-PINK. Fig. 381

Plant slender, to 5 dm tall or a little more. Leaves mostly 1–2 dm long, 2–6 mm wide, ribbed. Raceme loosely flowered, up to 12-flowered, opening successively up the raceme, the flowering period usually of several weeks' duration. Flowers rose-pink to white tinged with pink, sometimes white. Sepals linear to elliptic or oblong-lanceolate, 9–18 mm long, 3–6 mm wide, slightly keeled at the abruptly acute apex. Petals linear to linear-oblong or rarely narrowly oblanceolate, 1.2–1.5 cm long, 2–4 mm wide, obtuse to acute, often with slightly sinuate margins. Lip 8–12 mm long, 5–9 mm wide, lateral lobes separated from the midlobe by a short isthmus with almost parallel sides, midlobe obovate to obcordate or narrowly flabellate, truncate to slightly rounded apically, apiculate or occasionally retuse with an apicule in the sinus; disc bearded on the lower central portion to about the middle of the midlobe with clavellate (often bifurcate) hairs; column 8–10 mm long, broadly and abruptly winged on each side near the apex, 6–8 mm wide across the wings; the wings (when spread out) forming a transversely semielliptic lamina which is distinctly truncate at the basal margins forming a right angle with the column. (*Limodorum pallidum* (Chapm.) Mohr)

Wet pine savannas and flatwoods, along creeks, sphagnous bogs, edges of cypress-gum ponds and depressions, wet coastal prairies. Coastal plain, Va. to s. Fla., w. to La.

3. Calopogon barbatus (Walt.) Ames. BEARDED GRASS-PINK. Fig. 382

Plant slender, 1.5–4.5 dm tall. Leaves, when present, 5–18 cm long, about 2 mm wide. Raceme short, 3–5-flowered, rarely more, flowers opening almost simultaneously or in rapid succession, rose-pink, rarely white. Sepals ovate-deltoid to linear-oblong, 1.3–1.7 cm long, 4–7 mm wide, acute or apiculate. Petals with a short claw, varying from narrowly oblong-pandurate to ovate-lanceolate or oblong-elliptic, with a distinct constriction near the middle, or with an ovate-orbicular base and gradually tapering to oblong above, elongate, widest below the middle, 1.2–1.5 cm long, 3–5 mm wide, obtuse or abruptly acute. Lip 1–1.3 cm long, 7–10 mm wide; lateral lobes near the base inconspicuous, separated from the large midlobe by a gradually dilated isthmus, midlobe widely obovate to suborbicular, widely rounded or sometimes retuse apically, with broadly rounded lateral margins; disc bearded on the central portion with clavellate hairs; column widely winged on each side near the apex, 7–8 mm long, 4.5–7.5 mm wide across the wings with the pair of wings (when spread out) forming a semiorbicular lamina which is either subtruncate at the base or tapering down the sides of the column. (*Limodorum parviflorum* (Lindl.) Nash)

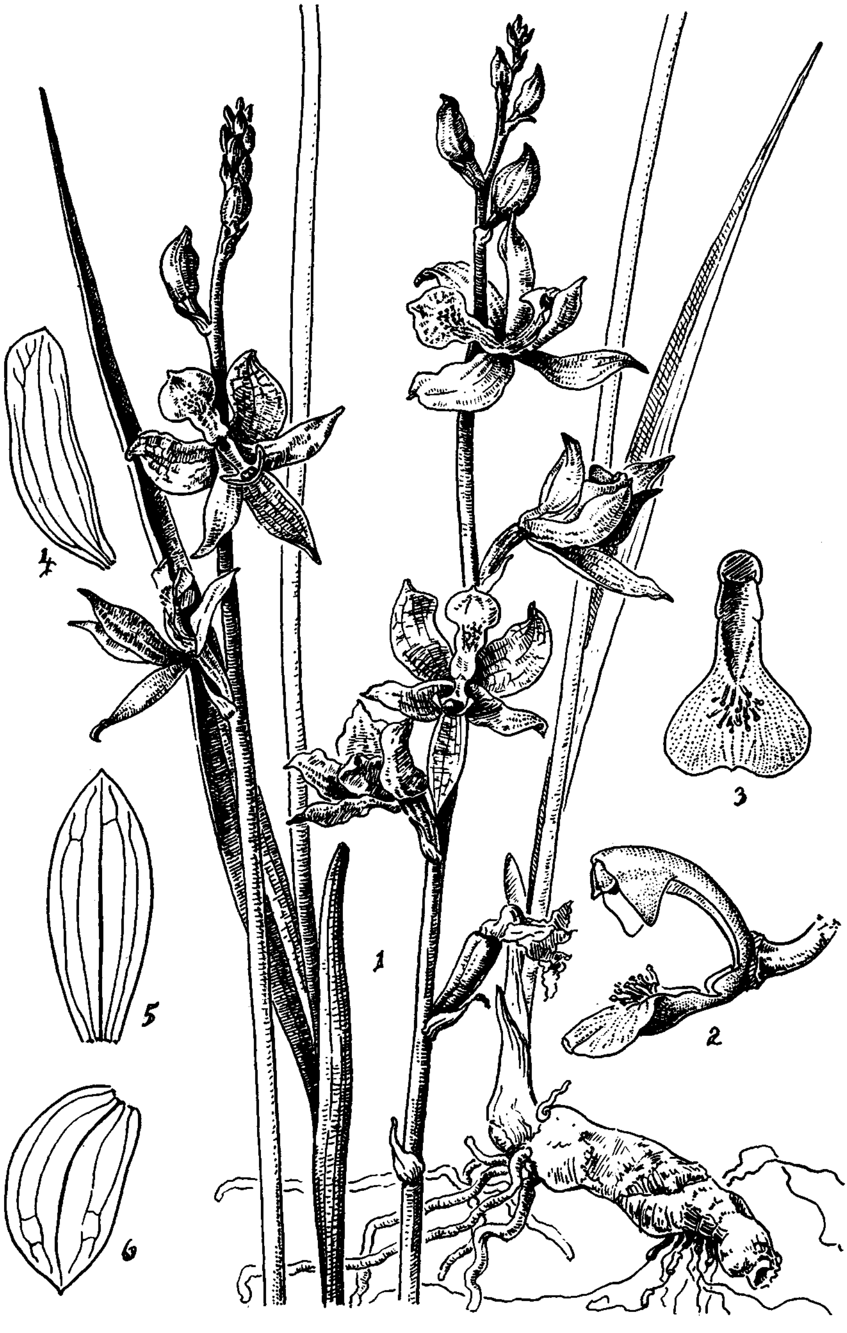

Fig. 381. **Calopogon pallidus:** 1, plants; 2, lip and column, side view; 3, lip, spread out; 4, petal; 5, dorsal sepal; 6, lateral sepal.

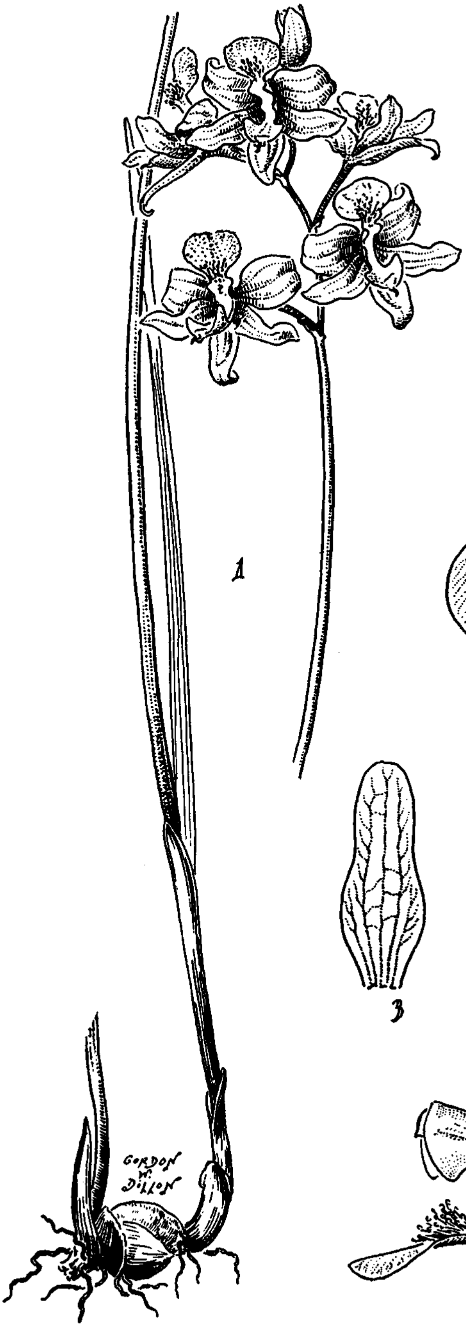
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Fig. 382. **Calopogon barbatus:** 1, plant; 2, dorsal sepal; 3, petal; 4, lateral sepal; 5, lip, spread out; 6, lip and column, side view.

Peaty depressions in savannas, low pinelands, acid meadows, grassy swamps, edges of cypress-gum ponds and depressions, rarely in oak woods and on sandy pine ridges. Coastal plain, N.C. to s. cen. pen. Fla., w. to La.

4. **Calopogon multiflorus** Lindl. MANY-FLOWERED GRASS-PINK. Fig. 383

Plant rigidly erect, 1.5–4.5 dm tall. Stem green below, dark madder-purple above, usually geniculate at the base, with several scarious imbricated sheaths at the base. Leaves (when present) 1 or 2, narrowly linear, long-acuminate, firm and rigid, strongly ribbed, 4–19 cm long, mostly less than 5 mm wide. Raceme densely or laxly 6–10-flowered, the flowers opening in rapid succession. Flowers vividly magenta-purple to crimson, showy. Dorsal sepal narrowly oblong, somewhat concave, acute to apiculate, 1.2–1.5 cm long, 4–6 mm wide; lateral sepals rising from a broad base, ovate-elliptic to broadly lanceolate, falcate, abruptly acute to acuminate, often long-acuminate, sometimes keeled at the apex, 1.1–1.3 cm long, 5–7 mm wide. Petals with a rather prominent claw, broadly oblong-elliptic, pandurate to obovate, rarely cuneate, rounded to obtuse or acute, widest above the middle, with the upper margin often irregularly crenulate, 1–1.3 cm long, 4–6 mm wide above the middle. Lip obscurely 3-lobed, 8–9.5 mm long; lateral lobes basal, broadly rounded, separated from the midlobe by a short isthmus with parallel sides; midlobe triangular-deltoid or broadly cuneate, the wide apex being either slightly rounded to truncate or retuse, sometimes apiculate, with essentially straight (not rounded) lateral margins, 8–10 mm wide; disc bearded on the central portion with clavellate (often bifurcate) hairs, the long hairs near the base being bright yellow, the shorter central hairs orange and the anterior hairs (not reaching the apical margin) gradually reduced to purple papillae. Column 5.5–7 mm long, broadly winged on each side near the apex, 4.5–6 mm wide across the wings; with the pair of wings (when spread out) forming a semiorbicular lamina which is truncate at the base.

Pine savannas and flatwoods, usually after burning. S.e. Ga., Fla., s. Ala., Miss.

9. Ponthieva

Ponthieva racemosa (Walt.) Mohr. SHADOW-WITCH. Fig. 384

Terrestrial scapose herb with fleshy or somewhat fibrous roots, usually about 3 dm tall. Leaves in a basal rosette, oblong-elliptic to oblanceolate, obtuse apically, to 15 cm long and 5 cm wide. Flowers whitish green, fragrant, in a lax terminal raceme. Sepals ovate to elliptic-lanceolate, spreading, to 8 mm long and 3.5 mm wide. Petals attached to the column above its base, oblique, often adherent to the dorsal sepal at the apex. Lip on the upper part of the flower, with its claw grown to the column above its base, abruptly dilated and ascending, suborbicular, saccate-concave, to 7 mm long.

In moist to wet soil along woodland streams, often on hammocks or soil elevated above water level about bases of trees in wet woodland, sometimes in wet savannas and pinelands. Coastal plain, s.e. Va. to s. Fla., w. to e. and s.e. Tex.; W.I., s. Mex., C.Am., cen. n. S.Am.

10. Spiranthes

Coarse or delicate terrestrial herbs with clustered tuberous or rarely fibrous roots. Leaves various, mostly basal, broadly ovate, elliptic, narrowly linear or semiterete, reduced above to persistent sheathing bracts. Flowers variously colored, usually white and variously tinged with green, yellow, cinnabar-red, brown or lavender, sometimes brick red, deep crimson, yellowish orange or yellowish scarlet, in a more or less spirally twisted showy or inconspicuous terminal spike. Sepals free; dorsal sepal and petals coherent; lateral sepals usually somewhat decurrent on the ovary and often gibbous at the base or extended to form a chinlike projection. Lip sessile or with a short claw, concave and embracing the column, spreading or arcuate-recurved at the apex, crisped,

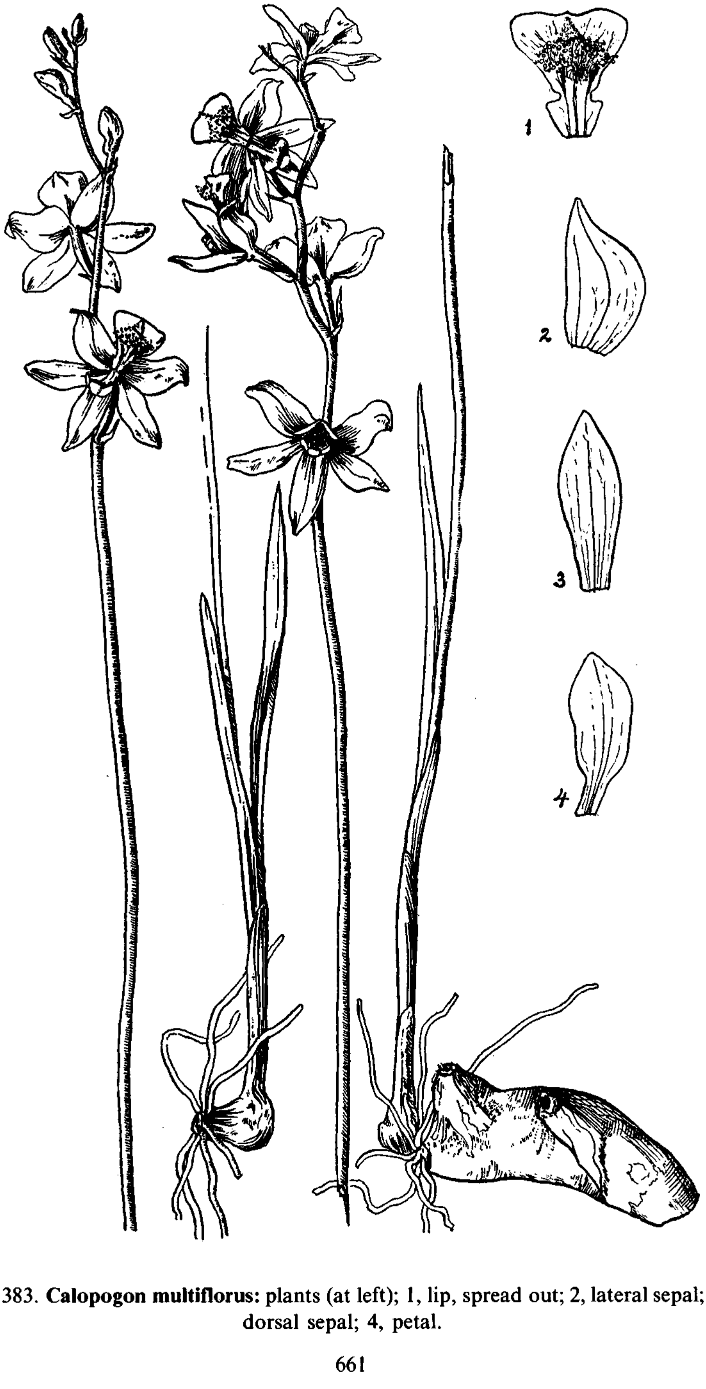

Fig. 383. **Calopogon multiflorus:** plants (at left); 1, lip, spread out; 2, lateral sepal; 3, dorsal sepal; 4, petal.

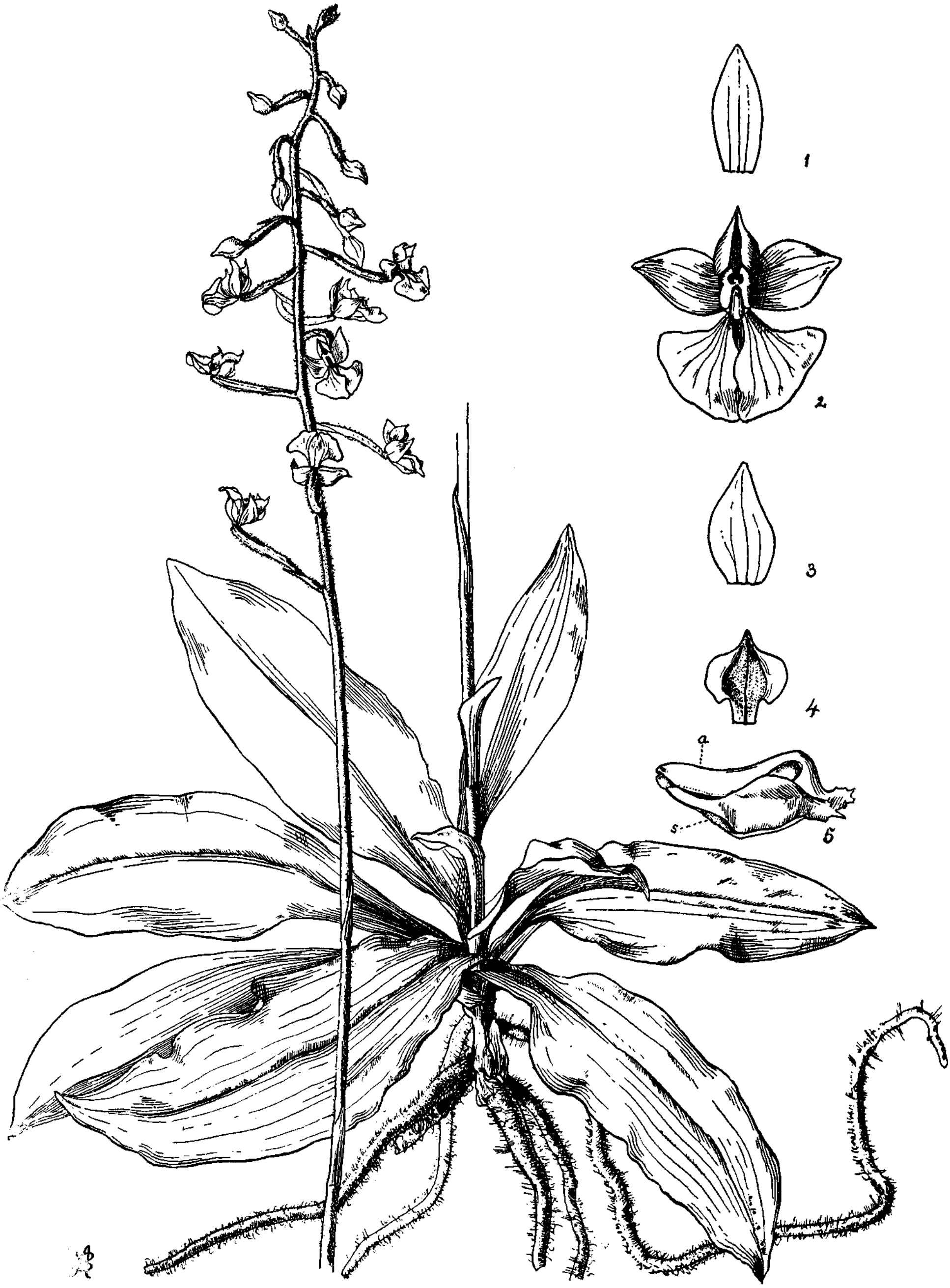

Fig. 384. **Ponthieva racemosa:** plant (left); 1, dorsal sepal; 2, flower, partly spread out; 3, lateral sepal; 4, lip, spread open; 5, column (a, anther, s, stigma), side view.

wavy, toothed, with a minute or conspicuous callosity on each side at the base, sometimes without the callus. Column short, terete to clavate, essentially footless or extended into a long foot at the base; anther erect on the back of the column, 2-celled; pollinia 2, powdery-granular, narrowly obovoid, their filaments coherent to the narrow viscid gland which is set in the thin beak (rostellum) terminating the column; after removal of the gland the beak is left as a 2-toothed or forked tip. Capsule erect, ellipsoid to ovoid or obovoid, sometimes 3-keeled.

1. Flowers forming a dense cylindrical spike, apparently in several spiral ranks; basal leaves (when present) with linear, lanceolate, oblong-elliptic or oblanceolate blades, without a distinct petiole, lower part sheathing the stem.
2. Spike 1.5 cm or less in diameter; lip 5.5 mm long or less. 1. *S. ovalis*
2. Spike 2–3 cm in diameter; lip 6–14 mm long.
3. Lip essentially oblong (although slightly constricted at about the middle), the apex rounded to truncate. 2a. *S. cernua* var. *cernua*
3. Lip broadest in the basal half, tapering to an obtuse to subacute apex. 2b. *S. cernua* var. *odorata*
1. Flowers forming a loose or dense (usually spiral) single rank, often secund; basal leaves (when present) with ovate, oblong-elliptic, lanceolate or semiterete blades, with a distinct petiole or with the lower part sheathing the stem.
4. Basal leaves spreading, petiolate, widely ovate to narrowly oblong-elliptic.
5. Plant essentially glabrous throughout.
6. Lip with a broad green stripe on the central portion of the disk; leaves mostly withering or falling early; usually flowering in autumn. 3a. *S. gracilis* var. *gracilis*
6. Lip with a broad yellow stripe on the central portion of the disk, often flecked with green; leaves mostly persistent; usually flowering in spring. 3b. *S. gracilis* var. *floridana*
5. Plant with a densely pubescent spike; lip deeply fringed and with a prominent tuft of hairs on the disk near the apex. 3c. *S. gracilis* var. *brevilabris*
4. Basal leaves erect or ascending, narrow, linear, narrowly lanceolate or oblong-elliptic, without a petiole, the lower portion sheathing the stem.
7. Flowers secund (rarely slightly spiraled); lip tapering from a broad base to an obtuse apex. 4. *S. longilabris*
7. Flowers strongly spiraled; lip ovate or orbicular-quadrate to oblong-quadrate.
8. Lip oblong-elliptic to oblong, with parallel lateral margins or often broadest at the distal end, membranaceous, usually veined with green; spike subglabrous or very sparsely pubescent with capitate hairs. 5. *S. praecox*
8. Lip ovate to ovate-oblong or ovate-elliptic, broadest at or near the base, usually fleshy-thickened; spike more or less pubescent with capitate or sharp-pointed hairs.
9. Spike densely pubescent; ovaries usually covered by a thick mat of reddish brown, sharp-pointed hairs; lip ovate to ovate-elliptic. 6. *S. vernalis*
9. Spike more or less pubescent with capitate hairs; lip ovate-oblong, often from a suborbicular base, conspicuously laciniate along the apical margins. 7. *S.* × *laciniata*

1. Spiranthes ovalis Lindl. LESSER LADIES' TRESSES. Fig. 385

Plant glabrous below, more or less pubescent above, 1.4–4.5 dm tall. Leaves 2 or 4, basal, oblong-elliptic to oblanceolate or linear-lanceolate, obtuse to subacute (rarely acute to acuminate), 5–15 cm long, 6–15 mm wide. Spike slender, somewhat congested, spiraled, flowers in several ranks. Flowers white; less than 5 mm long. Sepals and petals linear-lanceolate, 4–5 mm long, 1–2 mm wide. Lip rhombic-ovate to ovate-oblong, broadly rounded at the base, often constricted above the middle, narrowed or rarely dilated at the apex, arcuate-recurved in natural position, callosities slender, rarely stout, strongly incurved. (*Ibidium ovale* (Lindl.) House)

Moist shady woods, edges of thickets, edges of swamps, palmetto swamplands, rarely in floodplain forests. Va. to Mo., generally southward to n. pen. Fla., w. to e. Tex.

2. Spiranthes cernua (L.) L.C. Rich. NODDING OR FRAGRANT LADIES' TRESSES. Fig. 385

Plant glabrous below, downy-pubescent above, occasionally stoloniferous (especially in swampy places), 1–5.5 (–9.5) dm tall. Leaves mostly basal or falling early, linear to lanceolate, acute to acuminate, 5–40 cm long, 5–20 mm wide. Spike densely flowered,

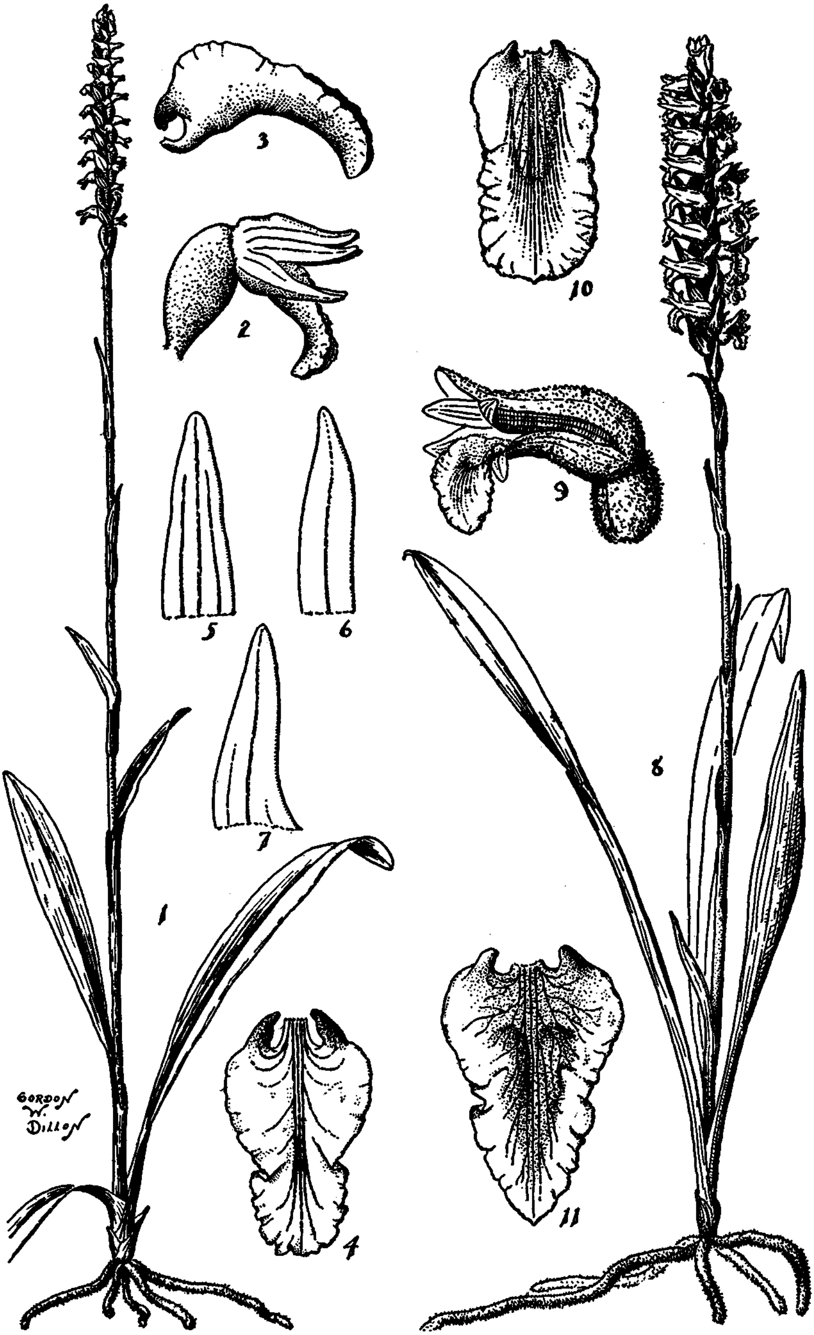
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Fig. 385. 1–7, **Spiranthes ovalis:** 1, plant; 2, flower, side view; 3, lip, side view; 4, lip, spread out; 5–7, sepals; 8–10, **Spiranthes cernua** *var.* **cernua:** 8, plant; 9, flower, front-side view; 10, lip, spread out; 11, **Spiranthes cernua** *var.* **odorata:** lip spread out.

compact, flowers small, nodding, in 2–4 (rarely 1) spiral or vertical ranks, 3–18 cm long, 2–3 cm across. Flowers white, sometimes marked with green or cream-tinged, usually fragrant. Perianth parts somewhat downy on the outer surface; sepals oblong-lanceolate, obtuse to subacute, 6–13.5 mm long, to about 3 mm wide, the lateral sepals free; petals coherent with the dorsal sepal, linear to linear-lanceolate, obtuse to acute, 6–13.5 mm long, 1–2 mm wide. Lip ovate-oblong to oblong, arcuate-recurved, sometimes rhombic with the basal half dilated, apical margins erose or crisped, basal callosities prominent, pubescent. (*Ibidium cernuum* (L.) House)

2a. var. *cernua.* Lip ovate-oblong, 6–10 mm long, 3–6 mm wide at the widest point, arcuate-recurved, usually constricted near the middle and dilated at the apex, or becoming abruptly oblong-elongate from an ovate-suborbicular base, margins crisped or erose.

Swamps, wet woodlands, stream bottoms, grassy seepage bogs. N.S. and Ont., s. to Minn., e. N.Dak. and S.Dak., generally southward to Fla. and Tex.; N. Mex.; Utah.

2b. var. *odorata* (Nutt.) Correll. The thickish lip of var. *odorata* is broadly ovate instead of oblongish as in var. *cernua.*

Occurring sparingly throughout the area of distribution of var. *cernua* but attaining maximum development in the southeastern states where it commonly forms stoloniferous colonies in water and mud of swamps, marshes, and along wooded rivers and streams.

3a. Spiranthes gracilis (Bigel.) Beck. var. **gracilis.** SLENDER LADIES' TRESSES. Fig. 386

Plant slender, essentially glabrous throughout, rarely sparsely pubescent above, 1.8–7.5 dm tall, occasionally 2 or 3 plants from the same rootstock. Leaves basal, falling early, broadly ovate to elliptic or ovate-lanceolate, short-petioled; blade 1.5–6.6 cm long, 1–2.3 cm wide. Spike slender, densely or loosely flowered, strongly spiraled or occasionally secund, rarely bifurcate, 3–26 cm long. Flowers small, white with a green stripe in the center of the lip, in a single rank. Perianth 4–6 mm long, sepals and petals about equal in length, 4–5.5 mm long; dorsal sepal elliptic-oblong to oblong-lanceolate, obtuse to acute, lateral sepals lanceolate, acute to somewhat acuminate; petals coherent with the dorsal sepal, linear, obtuse to subacute. Lip oblong-quadrate to elliptic-oblong, 4–6 mm long, about 2.5 mm wide, with the slightly grooved central portion conspicuously green, the apical margins crenulate to somewhat fringed-erose, basal callosities short, erect. (*Ibidium gracile* (Bigel.) House)

Mucky or boggy places in low pineland, pine savannas and coastal prairies, swamps, evergreen shrub bogs, fields, meadows, sandy woodlands. N.S. and N.B. w. to w. Ont. and Minn., generally southward to n. pen. Fla., and e. and s.e. Tex.

3b. var. **floridana** (Wherry) Correll.

Similar to var. *gracilis* but the lip having a yellow instead of a green center, the basal leaves much longer and narrower and persistent. (*Spiranthes brevilabris* Lindl. var. *floridana* (Wherry) Luer)

Inhabiting similar places to var. *gracilis*; Coastal plain, from e. N.C. to s. Fla., w. to s.e. Tex.

3c. var. **brevilabris** (Lindl.) Correll.

Similar to var. *gracilis* but the spike densely pubescent, the basal leaves persistent. (*Spiranthes brevilabris* Lindl.)

Occurring in habitats similar to var. *gracilis* from cen. pen. Fla. to s.e. Tex.

4. Spiranthes longilabris Lindl. GIANT SPIRAL ORCHID. Fig. 387

Plant slender, flexuous, essentially glabrous throughout, occasionally pubescent above, 1.2–6 dm tall. Leaves (when present) basal, linear to narrowly lanceolate, acute, 3–10 cm long, mostly less than 5 mm wide. Spike slender, secund, slightly spiraled at most, 5–14 cm long. Flowers white or white tinged with cream color, conspicuously gaping,

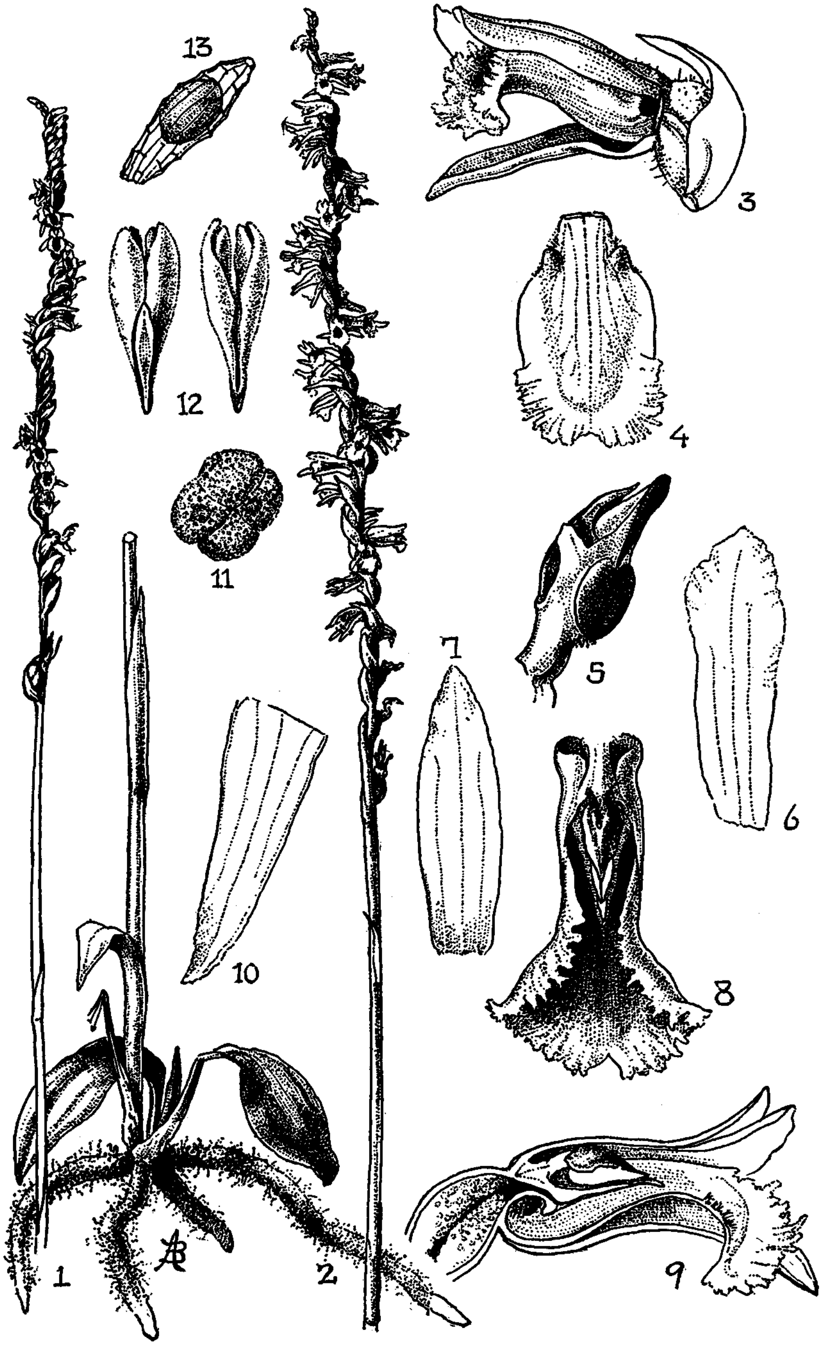

Fig. 386. **Spiranthes gracilis:** 1–2, plant; 3, flower, side view, with one lateral sepal removed; 4, lip, spread out; 5, column; 6, petal; 7, dorsal sepal; 8, lip and column, in natural position, front view; 9, longitudinal section through center of perianth and ovary; 10, lateral sepal; 11, pollen tetrad, highly magnified: 12, pollinia, from below (at left), from above (at right); 13, seed, highly magnified.

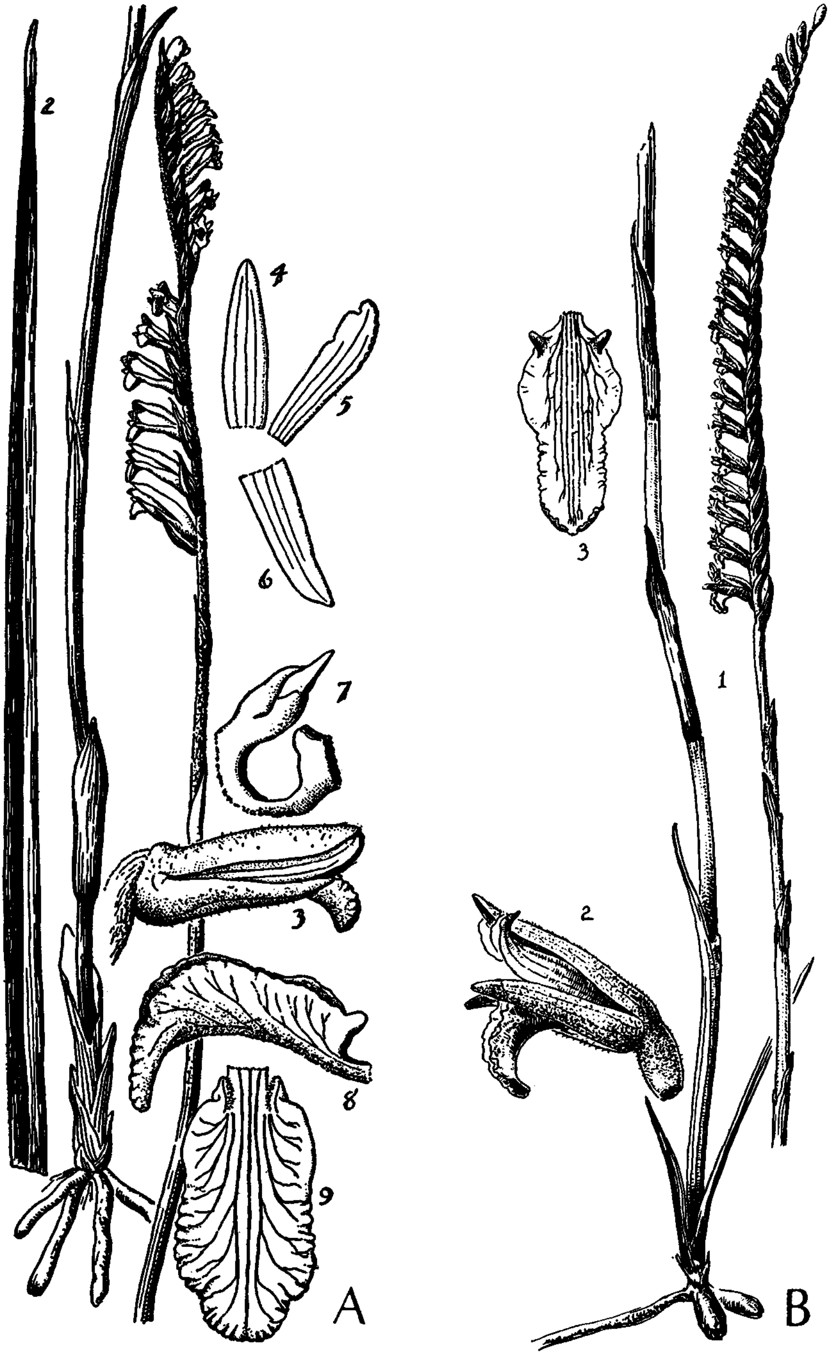

Fig. 387. A, **Spiranthes praecox:** 1, plant; 2, leaf; 3, flower, side view; 4, dorsal sepal; 5, petal; 6, lateral sepal; 7, column and base of lip, side view; 8, lip, side view; 9, lip, spread out; B, **Spiranthes longilabris:** 1, plant; 2, flower, side view; 3, lip, spread out.

projecting almost horizontally away from the rachis. Sepals 6–10 mm long, 2–3 mm wide; dorsal sepal oblong-elliptic to oblong-lanceolate, subacute to acute; lateral sepals linear-lanceolate, spreading and recurved upward. Petals linear, obtuse to subacute, 6.5–9 mm long, about 1 mm wide. Lip yellow-white, narrowly ovate to ovate-oblong, from a broadened base tapering to an obtuse to subacute apex, strongly arcuate-recurved, usually somewhat dentate or crenate along the apical margin, 6–10 mm long, 3–5.5 mm wide near the base, callosities rather slender. (*Ibidium longilabre* (Lindl.) House)

Wet pine savannas and flatwoods, swamps, marshes, wet prairies, sandy bogs. Coastal plain, N.C. to s. Fla., w. to s.e. Tex.

5. Spiranthes praecox (Walt.) Wats. GRASS-LEAVED LADIES' TRESSES. Fig. 387

Plant usually slender, essentially glabrous throughout, occasionally sparsely pubescent above, 2–7.5 dm tall. Leaves (when present) as many as 7, mostly basal, narrowly linear to filiform, 10–25 cm long, 1–5 mm wide. Spike loosely to densely flowered, spirally twisted or often nearly secund, 3–15 cm long, about 1.5 cm across, sparsely pubescent, the articulated hairs capitate. Flowers white, or white and veined and marked with green. Sepals usually puberulent on the outer surface, 5.5–10 mm long, 2–3 mm wide; dorsal sepal oblong-elliptic to lanceolate, subacute, often slightly constricted near the apex; lateral sepals lanceolate, acute. Petals coherent with the dorsal sepal, linear, obtuse to subacute or rarely acute, 5.5–10 mm long, 1–2 mm wide. Lip thin, with a short claw, oblong to broadly oval-elliptic, often dilated and broadest distally, prominently veined with green or with green on the central portion of the disk, mostly wavy and slightly crenulate or toothed on the apical margin, 5.5–11 mm long, 2–6 mm wide, basal callosities slender or sometimes stout, straight. (*Ibidium praecox* (Walt.) House)

Low pine savannas and flatwoods, wet prairies, meadows, cypress swamps, bogs, coastal marshes. Coastal plain, N.J. to s. Fla., w. to e. and s.e. Tex.

6. Spiranthes vernalis Engelm. & Gray. SPRING LADIES' TRESSES. Fig. 388

Plant stout or slender, densely and copiously pubescent above, 1.8–11 dm tall. Leaves basal or extending partly up the stem, suberect and ascending, linear to narrowly lanceolate, acuminate, often strongly keeled or semiterete. Spike densely flowered, spiraled, 3–25 cm long, the rachis and ovaries covered with a dense mat of reddish brown articulated, sharp-pointed hairs. Flowers yellowish or sometimes greenish, often white, often fragrant, in a single rank or very rarely 2-ranked. Perianth parts pubescent on the outer surface; dorsal sepal oblong-lanceolate to lanceolate, obtuse to acute, concave at the base, 5.5–10 mm long, 2.5–3 mm wide near the base; lateral sepals lanceolate, acute, 5–9.5 mm long. Petals coherent with the dorsal sepal, linear to linear-elliptic, obtuse, 5–9 mm long, 1–2 mm wide. Lip thickened, broadly ovate to rhombic-ovate or sometimes ovate-oblong, arcuate-recurved, often somewhat dilated and crenulate-wavy at the apex, 4.5–8 mm long, 2.5–6 mm wide near the base, basal callosities stout, incurved, pubescent. (*Ibidium vernale* (Engelm. & Gray) House)

Wet prairies, savannas, meadows, fresh and salt marshes, swamps, beaches, dunes. S. N.E. to N.C., w. through Tenn., w. Ky., s. Ill., Mo., s.e. Nebr., generally southward to s. Fla., and cen. Tex.; N.Mex.; Mex., Guat.

7. Spiranthes × laciniata (Small) Ames. LACE-LIP SPIRAL ORCHID.

Rather coarse plant with characters intermediate between *S. praecox* and *S. vernalis.* The hairs of the spike are blunt or capitate as in *S. praecox.* Flowers resemble those of *S. vernalis* in size and shape but the distal portion of the lip is somewhat more expanded and denticulate-laciniate. (*Ibidium laciniatum* (Small) House)

Cypress swamps, marshes, pools, boggy depressions, savannas and prairies. Coastal plain, s.e. N.C. to s. Fla., w. to s.e. Tex.

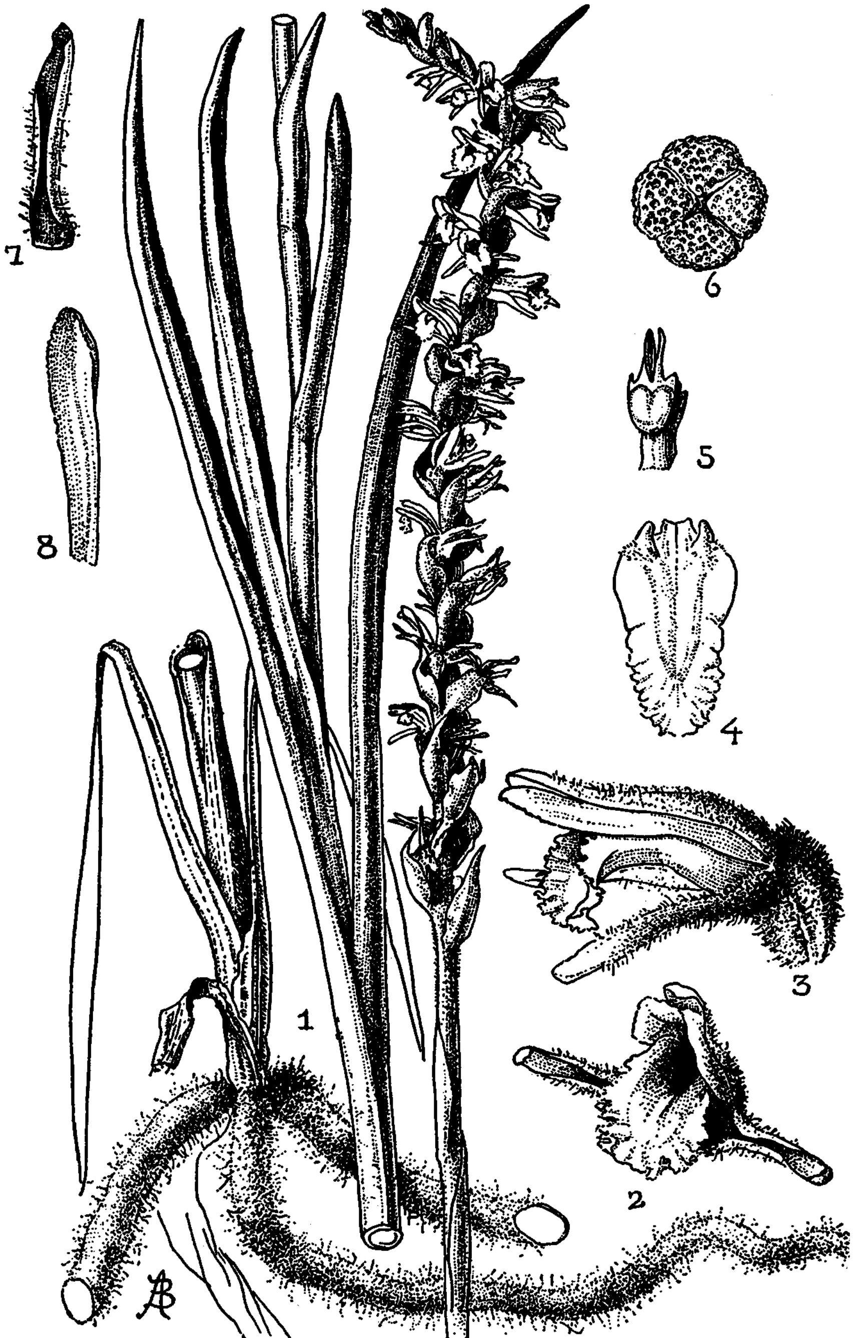

Fig. 388. **Spiranthes vernalis:** 1, plant; 2, flower, front view; 3, flower, side view; 4, lip, spread out; 5, column; 6, pollen tetrad, highly magnified; 7, lateral sepal; 8, petal.

11. Erythrodes

Erythrodes querceticola (Lindl.) Ames. LOW ERYTHRODES. Fig. 389

Plant leafy, glabrous, 6–30 cm tall, with short rhizomes. Stem erect from a geniculate-prostrate base, light green or yellowish or brownish green. Leaves short-petioled, the blades ovate to ovate-lanceolate or narrowly lanceolate, acute to acuminate, broadly rounded to subcordate at base, 1.5–8 cm long, 1–3 cm wide near the base, light or dark green, often with whitish reticulate veins, reduced above to translucent sheathing bracts; petiole thin, translucent, surrounding the stem by a tubular base, about 2 mm long. Raceme densely to laxly few–many-flowered, 1.5–10 cm long, 1–2 cm across. Flowers subsessile, yellowish green or white. Dorsal sepal narrowly ovate-oblong to lanceolate or linear-oblong, somewhat oblique, obtuse, 3–4.5 mm long, 1–2 mm wide, with a conspicuous central vein. Petals linear to linear-lanceolate, somewhat oblique, obtuse to acute, 3–4.5 mm long, 1–1.3 mm wide. Lip produced below into a saccate spur, 5–7 mm long (including the spur); lamina panduriform, divided into 2 subequal parts by a shallow constriction on each side; basal half suborbicular, concave, thickened and partly embracing the column in natural position; upper half 3-lobed, obcordate in outline, 2–2.5 mm wide across the lateral lobes, the lateral lobes being short, divergent and broadly rounded and the apical lobe triangular-apiculate to subulate, strongly arcuate-recurved and about 1 mm long; spur saccate, descending, provided with 3 conspicuous nerves. (*Physurus querceticola* Lindl.; incl. *P. sagraeanus* A. Rich.)

Moist rich soil in densely shaded swamps and wet woodlands, hammocks, wet barrens, moist hardwood forests and ravines; often associated with *Ponthieva.* Fla. to La. and e. Tex.; Mex., C.Am., W.I., n. S.Am.

12. Zeuxine

Zeuxine strateumatica (L.) Schltr. in Engl. Fig. 390

Stems erect or ascending from a decumbent base, slender, glabrous throughout, greenish, tinged with purple or brown, 4–17 cm tall. Roots fibrous, short, clustered at the nodes on the lower part of the stem and rhizome. Leaves sessile, linear to narrowly lanceolate, long-acuminate, with the lower part inflated and sheathing the stem, semi-translucent below, 1.5–9 cm long, up to about 5 mm wide. Spike densely few–many-flowered, 1–8 cm long, 1–2 cm across. Flowers small, white or yellowish with a yellow lip. Dorsal sepal erect, concave, ovate-oblong to oblong-elliptic, obtuse, 4–4.5 mm long, 2 mm wide; lateral sepals free, ovate-oblong to oblong-elliptic, obtuse to subacute, 4–5 mm long, 2–2.5 mm wide. Petals connivent with the dorsal sepal and forming a hood over the column, oblong-lanceolate, oblique to somewhat falcate, obtuse, 4–4.5 mm long, about 1.5 mm wide. Lip fleshy-thickened, arising from the base of the column and adnate to it for a short distance, about 4 mm long, more or less pandurate when spread out (widest near the apex), concave-saccate and cymbiform at the base, with the lower half oblong and slightly rounded on the lateral margins, abruptly expanded above into a suborbicular or transversely elliptic lobe.

Native in tropical Asia. Introduced and naturalized in Fla. and s.e. Ga. Sporadic in occurrence, commonly in some abundance locally in one season, often not appearing there again. In lawns, open shrubby places, swamps, coastal prairies, greenhouses, window boxes.

13. Malaxis

Inconspicuous, glabrous, terrestrial (rarely epiphytic) herbs arising from a slender or swollen base. Stem bearing 1–5 or more leaves at about the middle or near the base, occasionally the leaves just below the inflorescence. Raceme subumbellate or elongate. Sepals free or the lateral sepals more or less united, spreading. Petals ovate-lanceolate to

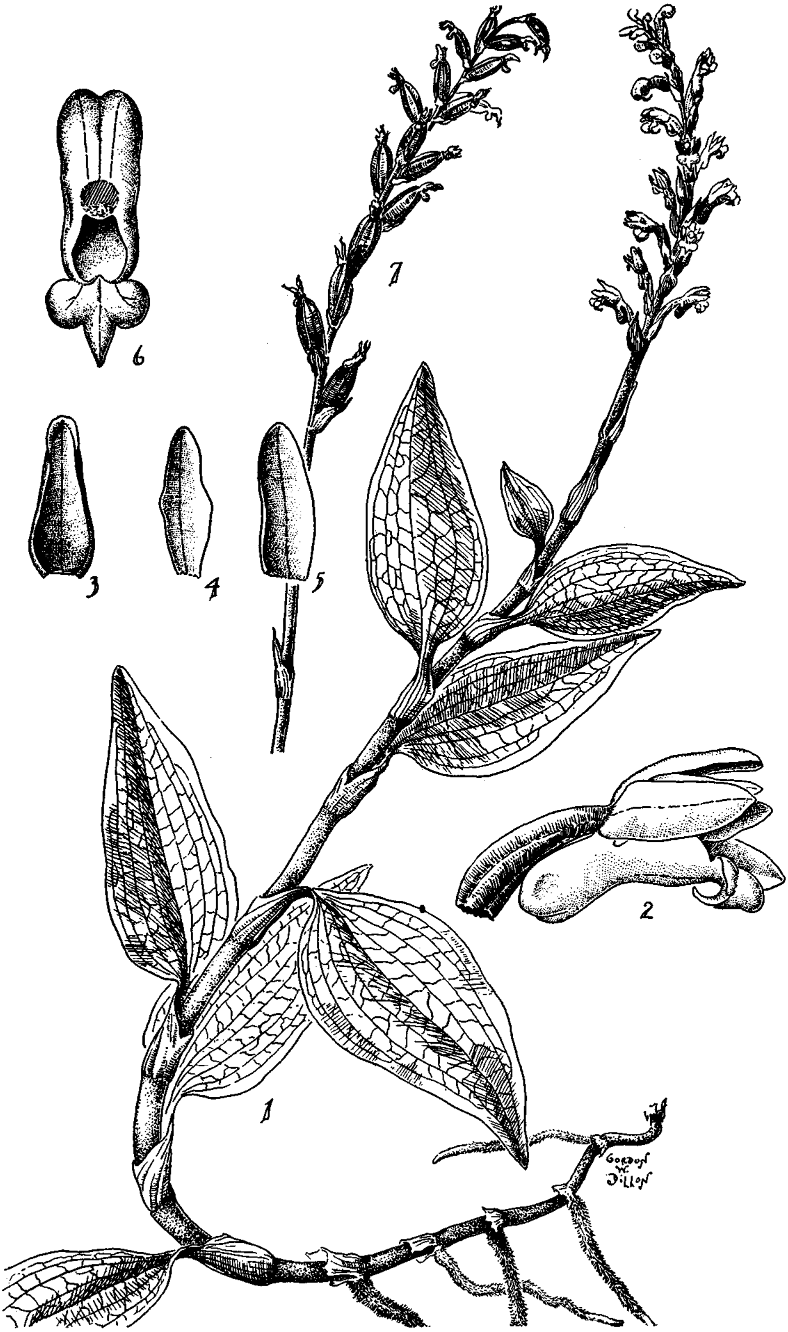
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Fig. 389. **Erythrodes querceticola:** 1, plant; 2, flower, side view; 3, dorsal sepal; 4, petal; 5, lateral sepal; 6, lip and spur, front view; 7, fruiting inflorescence.

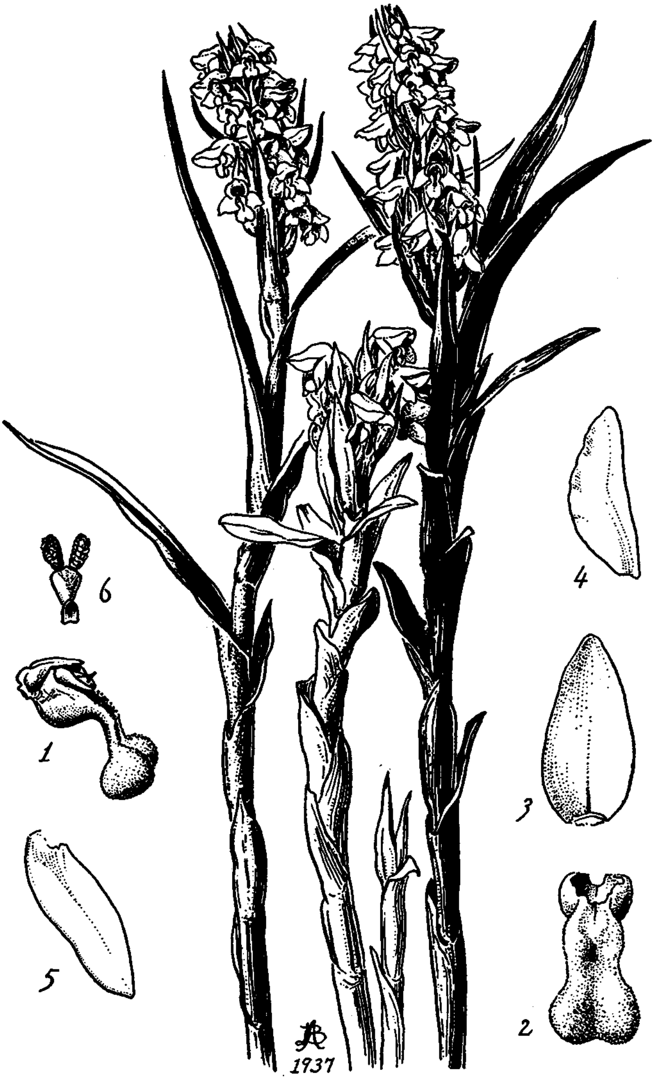

Fig. 390. **Zeuxine strateumatica:** three flowering plants (center); 1, lip and column, side view; 2, lip, front view; 3, dorsal sepal; 4, petal; 5, lateral sepal; 6, pollinium, much enlarged.

narrowly linear or filiform, often strongly coiled. Lip sessile, erect or spreading, sometimes tridentate at the apex, often auriculate at the base, concave to saccate or plane, often more or less callus-thickened. Column short, terete, often toothed at the apex. Anther terminal, erect or incumbent; pollinia 4, waxy.

- Leaves 2; lip uppermost, obtuse to acuminate. — 1. *M. spicata*
- Leaf 1; lip lowermost, unequally tridentate. — 2. *M. unifolia*

1. Malaxis spicata Sw. FLORIDA ADDER'S MOUTH. Fig. 391

Plant 7–45 cm tall. Leaves 2 (rarely 3), subopposite, abruptly spreading near the base or just below the middle of the stem, glossy, ovate to suborbicular, 2.5–10 cm long, 1.2–5.5 cm wide, obtuse to acute, strongly keeled along the midrib beneath. Raceme laxly few–many-flowered, subumbellate to elongate, 1.5–20 cm long. Flowers small. Sepals and petals green; sepals ovate-elliptic to elliptic, 2.5–3.5 mm long, 1.5–2 mm wide, concave, with strongly involute margins and a prominent midnerve. Lip pale yellow to orange-vermilion, uppermost, entire or subentire, cordate-ovate, prominently and obtusely auricled on each side at the base, 3–4 mm long (including the auricles), 2.5–3.3 mm wide near the base, strongly upcurved and subacute apically, shallowly saccate at the base, rim of the sac thickened; disk prominently 3-nerved, the lateral margins revolute. (Incl. *M. floridana* (Chapm.) Ktze.)

Hammocks, swamps, low moist woods, mucky soil of floodplain areas, rich wooded slopes, floodplain forests. Coastal plain, s.e. Va. to s. Fla. (not in the Fla. Panhandle); Bah. Is., W.I.

2. Malaxis unifolia Michx. GREEN ADDER'S MOUTH. Fig. 392

Plant bright green, 6–55 cm tall. Leaf solitary, sessile and clasping, orbicular-ovate to ovate-lanceolate, 1–9 cm long, 0.6–6.5 cm wide, obtuse to acute. Raceme subumbellate to slender-elongate, densely flowered, 1–16 cm long. Flowers minute, green. Sepals spreading, linear-oblong to oblong-elliptic, 1.8–3.5 mm long, 0.8–1.5 mm wide, subacute, 1-nerved, the margins often involute. Petals narrowly linear to filiform, 1.4–3 mm wide, strongly recurved. Lip lowermost in the flower at maturity, cordate-deltoid to cordate-ovate or oblong-quadrate 2–4 mm long, 1.5–3 mm wide, cordate or auricled on each side at the base, auricles widely rounded to acute and occasionally deeply notched, apex obliquely tridentate with 2 lateral teeth more or less elongate and obtuse to acute and the median tooth minute, thickened and apiculate; column minute, with 2 short lateral teeth at the apex. (Incl. *M. bayardi* Fern.)

Mixed forests of slopes, bogs, meadows, swamps, deep shaded ravines, edges of woodlands and thickets, seepage slopes. Nfld. to Man., Minn., s. to cen. pen. Fla. and e. Tex.; Cuba, Jam., Mex.

14. Liparis

Inconspicuous terrestrial (rarely epiphytic) scapose herbs arising from corms or pseudobulbs. Leaves 1 or more, basal, sheathing the stem below, fleshy or plicate. Inflorescence a lax few–many-flowered raceme terminating the scape. Sepals mostly oblong-lanceolate, free, spreading. Petals narrowly linear to filiform. Lip entire to emarginate or 3-lobed, mostly arcuate-recurved in natural position, attached to the base of the column. Column strongly incurved, with narrow lateral wings above; anther terminal, incumbent, operculate; pollinia 4 (2 in each anther cell), waxy, ovoid.

1. Leaves 3 or more, membranaceous, plicate. — 1. *L. elata*
1. Leaves 2, succulent, smooth.
  2. Lip 10 mm or more long, translucent, madder-purple. — 2. *L. lilifolia*
  2. Lip less than 5 mm long, opaque, yellowish green. — 3. *L. loeslii*

1. Liparis elata Lindl. TALL LIPARIS. Fig. 393

Plant slender or stout, 1.2–6 dm tall. Scape angled and prominently winged above,

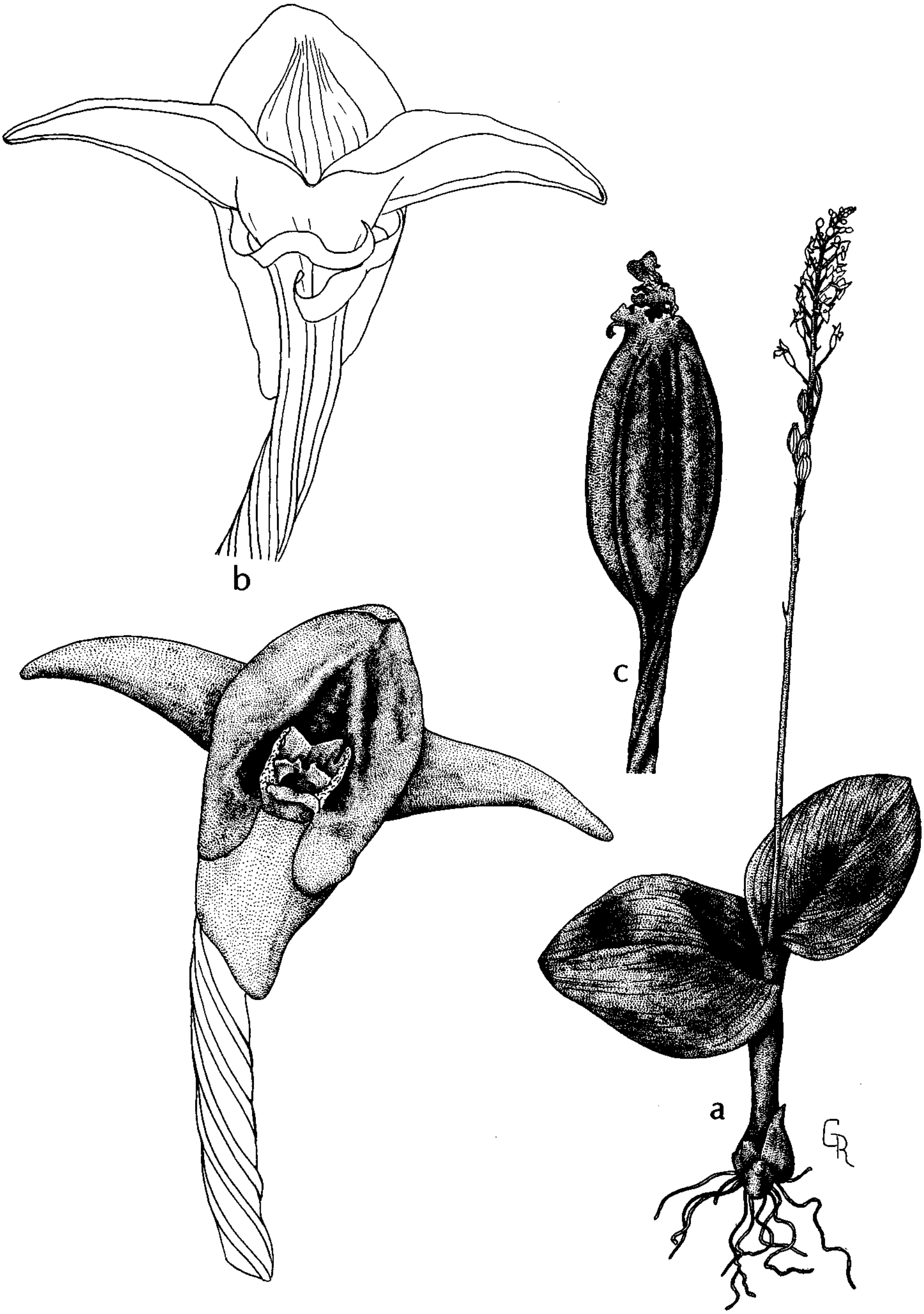

Fig. 391. **Malaxis spicata:** a, habit; b, flower (two views); c, capsule.

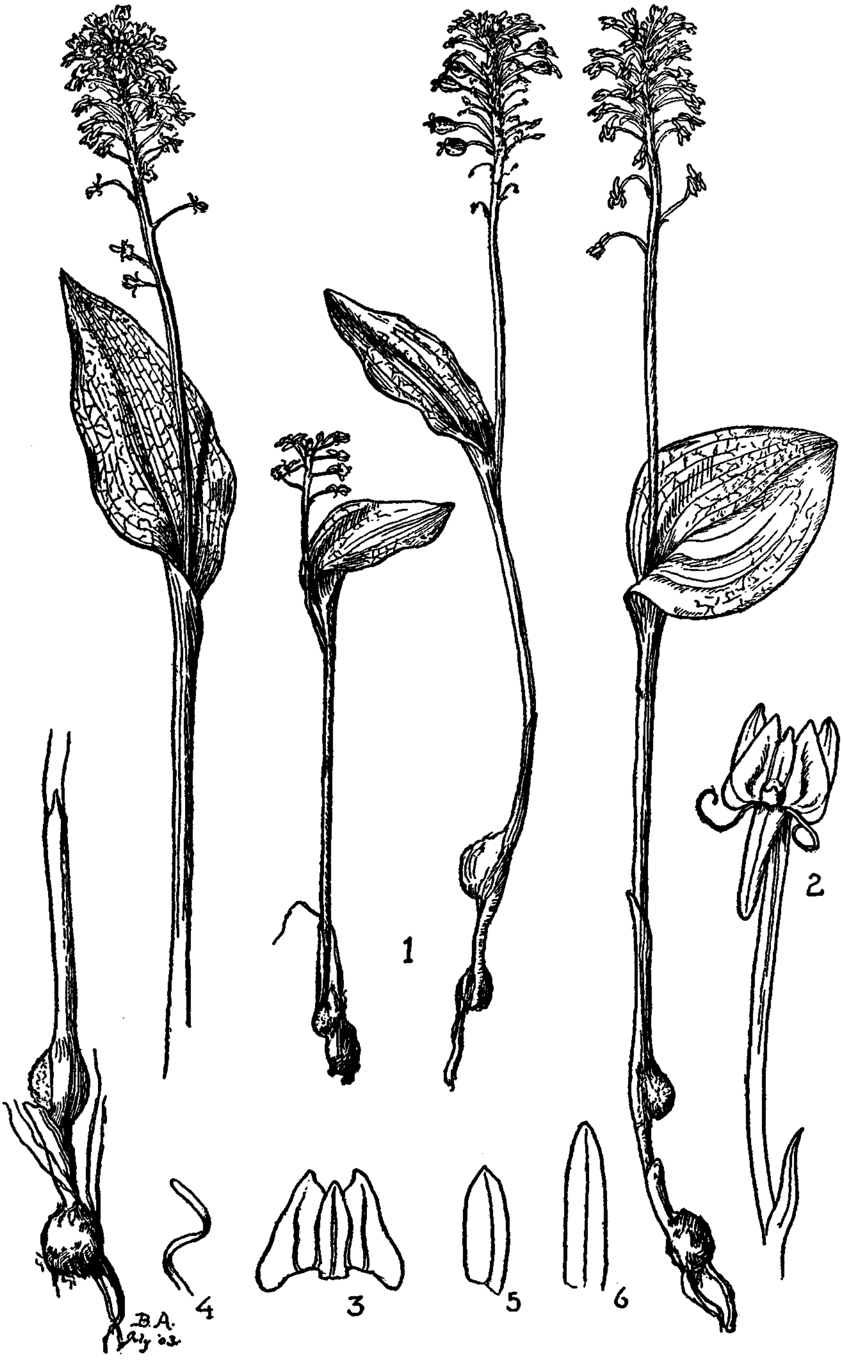
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Fig. 392. **Malaxis unifolia:** 1, plants; 2, flower, front view; 3, lip, spread out; 4, petal; 5, lateral sepal; 6, dorsal sepal.

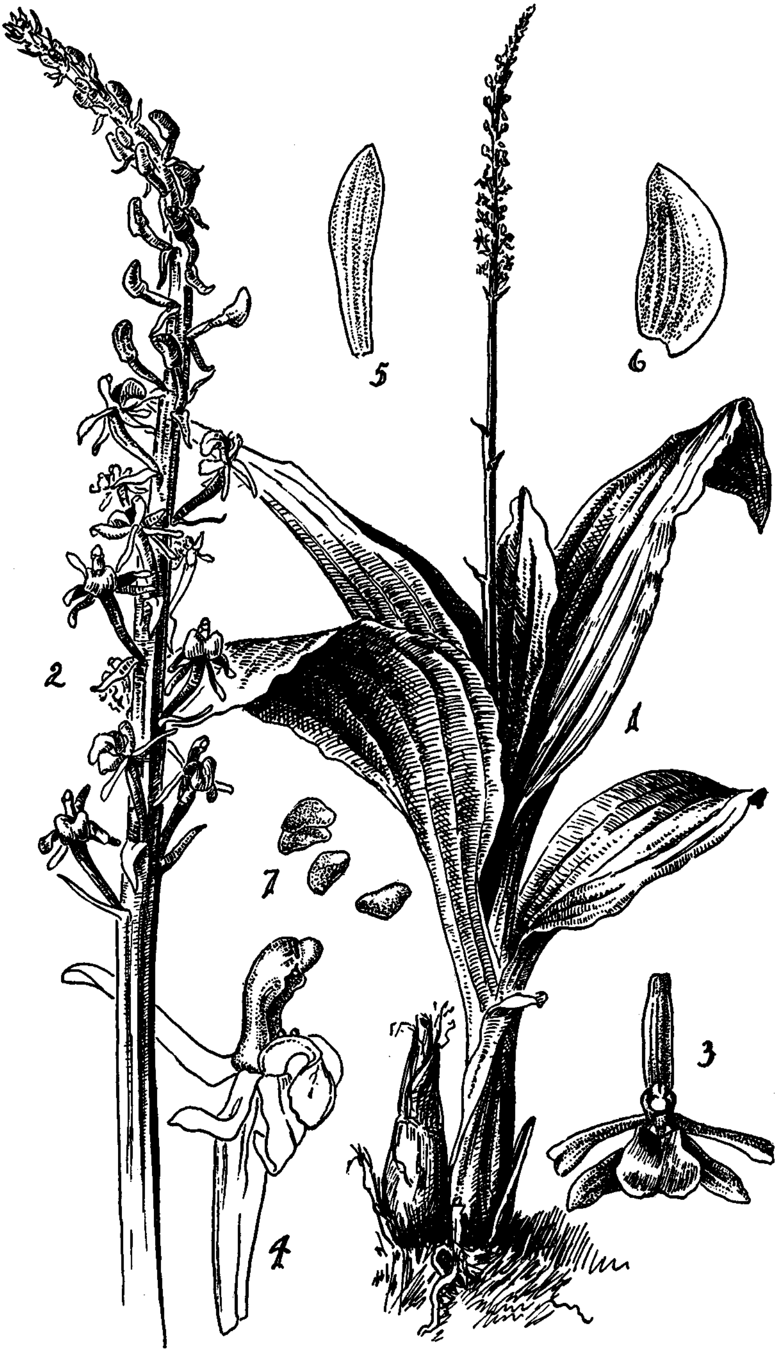

Fig. 393. **Liparis elata:** 1, plant; 2, inflorescence; 3, flower, front view; 4, flower, side view; 5, petal; 6, lateral sepal; 7, pollinia, enlarged.

suffused with madder-purple. Leaves 3–5 (rarely 2), subtended by scarious sheaths which envelop the pseudobulbs, ovate to elliptic or oblong-lanceolate, broadly rounded to abruptly acuminate above, plicate, 6–30 cm long, 5.5–12 cm wide, reduced above to minute bracts. Raceme laxly few–many-flowered, 3–26 cm long, 2–3 cm across. Flowers small, with rather stout pedicellate ovaries 7–12 mm long. Sepals greenish, streaked with madder-purple, with 5 prominent nerves; dorsal sepal oblong-elliptic to linear-oblong, broadly rounded to obtuse apically, 5–8 mm long, 1.8–4 mm wide; lateral sepals obliquely ovate-oblong to elliptic, obtuse to subacute, with the margins strongly revolute, 4–7 mm long, 2–3.5 mm wide. Petals greenish, streaked with madder-purple, linear-oblanceolate to narrowly spatulate, prominently 2–3-nerved, 5–7.5 mm long, 1–2 mm wide near the apex. Lip madder-purple, obcordate to broadly cuneate or oblong-flabellate, emarginate, occasionally with a small apicule in the sinus, strongly arcuate-recurved in natural position, slightly auricled on each side on the basal portion, prominently 5-nerved, the nerves giving rise to numerous veinlets. Column stout, strongly incurved above, with broad lateral wings and a small tooth on each side at the apex, 3.5–5 mm long.

Cypress prairies, cypress swamps on decaying logs and stumps, rich humus of hammocks, wet muck. W. pen. Fla.; s. Mex., C.Am., Venez., Braz., Peru, Ecu., W.I.

2. **Liparis lilifolia** (L.) L.C. Rich. ex Lindl. LILY-LEAVED TWAYBLADE. Fig. 394

Plant slender or stout, 4–25 cm tall. Stem angled and obscurely winged above, bright green, often tinged with purplish brown. Leaves glossy, ovate to elliptic, 4–18 cm long, 2–6 cm wide, obtuse to acute, keeled beneath. Raceme laxly few-flowered, 4–15 cm long. Flowers 5 or usually more. Sepals pale greenish white, translucent, oblong-lanceolate to lanceolate, 1–1.1 cm long, 2–3 cm wide when expanded, obtuse to acute, with 3 prominent veins. Petals madder-purple, pendent and curved, 1–1.2 cm long, with a single prominent vein. Lip mauve-purple tinged with green, cuneate-obovate to suborbicular, 1–1.1 cm long when expanded, 7.5–10 mm wide, apex abruptly mucronate, subtruncate, finely erose-serrulate along the apical margin, slightly auricled on each side at the base, translucent, with 5 prominent reddish purple veins which give rise to dichotomously branching veinlets. Column thick, clavate, about 3 mm long, with 2 blunt tubercles on the inner surface near the base.

Floodplain forests, thickets along streams, rich humus or moss along wooded streams, mountain ravines, forested slopes. Maine to Minn., s. to Ga., Ala., Mo.

3. **Liparis loeselii** (L.) L. C. Rich. FEN ORCHID. Fig. 394

Plant succulent, glabrous, mostly slender, pale green or yellowish green, 6–26 cm tall. Stems somewhat angled above. Leaves 2, oblong-elliptic to elliptic-lanceolate, obtuse to subacute, keeled beneath, 3–19 cm long, 1–6 cm wide. Raceme slender, laxly few-flowered (rarely 1-flowered), 2–10 cm long, 1–2 cm across. Flowers yellowish green or whitish, with the slender pedicellate ovaries 3–6 mm long. Dorsal sepal erect, obelisk in outline, arising from a rather broad hastate base, prominently 3-nerved, with the margins revolute, 5–6 mm long, 1.5–2 mm wide at about the middle; lateral sepals oblong-lanceolate to lanceolate, somewhat incurved, with the margins involute, prominently 3-nerved, 5–5.5 mm long, 1.5–2.2 mm wide at about the middle. Petals filiform, tubular, with a single prominent nerve, 4.5–5 mm long. Lip arcuate-recurved in natural position, narrowly cuneate, obovate to oblong or suborbicular when expanded, with an apiculate apex, slightly hastate or subauriculate on each side at the base, with the margins finely crenulate-wavy and with 5 prominent veins which give rise to numerous veinlets, 4.3–5 mm long, 3–3.5 mm wide above the middle. Column short, stout, about 2 mm long.

Moist grassy seepage slopes and banks, along streams in forests, cedar, spruce and tamarack swamps, peat bogs, wet meadows, thickets, cool mountain ravines, occasionally dry fields, and on marshy shores. N.S. and Que. to Man., s. to N.J. and in the mts. to N.C.; Ohio, n. Ind., n. Ill., e. Mo., N.Dak.; disjunct in Lee Co., Ala.

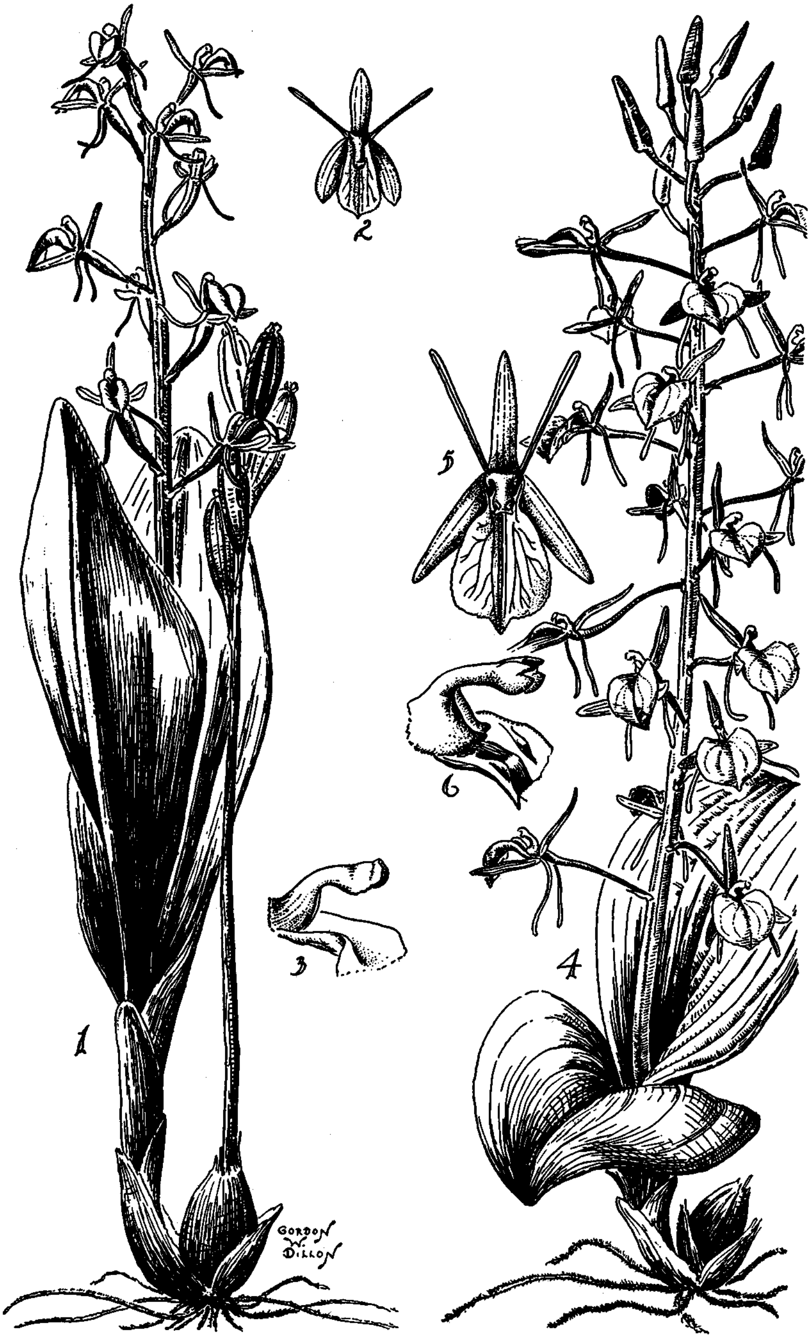

Fig. 394. 1–3, **Liparis loeselii:** 1, flowering plant, with previous year's fruiting inflorescence persisting; 2, flower, front view, spread out; 3, column, with basal part of lip, side view; 4–6, **Liparis lilifolia:** 4, plant; 5, flower, front view, spread out; 6, column, with basal part of lip, side view.

15. Aplectrum

Aplectrum hyemale (Muhl. ex Willd.) Torr. PUTTYROOT. Fig. 395

Plant scapose, glabrous, 2.8–5.5 dm tall from moniliform, horizontal rootstock, normally consisting of several subglobose, glutinous corms (connected by slender naked stolons) which produce slender fibrous roots at the base and, near the apex, a flowering scape in spring and a solitary, basal, short-petiolate leaf in autumn. Leaf plicate, dark green, with whitish nerves, often tinged with purple, elliptic to broadly elliptic, 1–1.7 dm long, 3–8 cm wide, acute, decaying in early spring before appearance of the scape. Raceme loosely few–15-flowered. Flowers greenish, yellowish or whitish, various marked with madder-purple, rarely white; pedicel stout, with ovary 8–10 mm long. Sepals and petals narrowly oblong-spatulate to oblong-elliptic, 1.1–1.4 cm long, 2.8–4 mm wide, obtuse to acute. Lip white, marked with magenta, 3-lobed, broadly obovate-cuneate in outline, 1–1.2 cm long, 7–7.5 mm wide across the ovate-oblong lateral lobes when spread out; disc with 3 longitudinal crests (lamellae) on the lower half; column compressed, about 7 mm long and 2 mm in diameter, minutely undulate-crenulate at the apex.

Mucky wet soil of wooded floodplains, peat bogs and tamarack swamps, rich low moist hardwoods, moist ravines. S.w. Que. and Vt. to Sask., s. to Ga., Tenn., and Ark.

16. Bletia

Bletia purpurea (Lam.) DC. PINE-PINK. Fig. 396

Plant glabrous, consisting of a short thick depressed corm bearing at the summit a few approximate leaves and a sublateral flowering branch, up to about 18 dm tall. Leaves (often falling away or fading early) linear to narrowly elliptic-lanceolate, plicate, long-acuminate, with the lower part sheathing the scape, 2–9 dm long, 1–5 cm wide. Inflorescence a simple or paniculate raceme borne on a long slender sublateral peduncle; peduncle with remote tubular sheaths, loosely few–many-flowered. Flowers pink, rose-purple or deep purple, rarely almost white, showy, with the slender pedicellate ovaries 9–18 mm long, variable in size. Dorsal sepal oblong-elliptic to ovate-lanceolate, subobtuse to acute, 1.5–2.6 cm long, 5–9 mm wide; lateral sepals obliquely ovate-oblong to elliptic-oblong, abruptly acute to acuminate, with the margins involute, 1.2–2 cm long, 5–8 mm wide. Petals obliquely ovate-oblong to elliptic or oblong-lanceolate, obtuse to acute, 1.2–2.1 cm long, 7–11 mm wide. Lip concave below, broadly cordate to ovate-cordate or cordate-subquadrate when spread out, conspicuously 3-lobed above the middle, strongly recurved in natural position, with the base truncate to subcordate, 1–1.8 cm long, 8–14 mm wide across the lateral lobes when expanded; lateral lobes incurved in natural position, broadly rounded at the base, tapering to a triangular-obtuse to rounded apex; midlobe suborbicular, truncate to deeply emarginate at the apex, with the margins undulate-crenate, 5–10 mm wide; disc prominently veined, with 5–7 yellowish lamellae extending from near the base of the lip to near the apex of the midlobe and with 2 shorter lamellae on the lateral lobes. Column strongly arcuate, clavellate, with narrow lateral wings, 8–12 mm long.

Dry pinelands or flatwoods, rocky woods, or on palmetto roots, cypress swamps on the bases of tree trunks and on stumps and knees of cypress trees. S. pen. Fla.; Bah. Is., W.I., s. Mex., C.Am., n. S.Am.

17. Eulophia

Eulophia alta (L.) Fawc. & Rendle. WILD COCO. Fig. 397

Plant erect, coarse, from a bulbous corm, 7.5–17 dm tall. Stem short, mostly concealed by the elongated tubular membranacous leaf-sheaths. Leaves 3 or 4, clustered at the summit of the corm, sheathing the short stem, elliptic-lanceolate, plicate, acute to

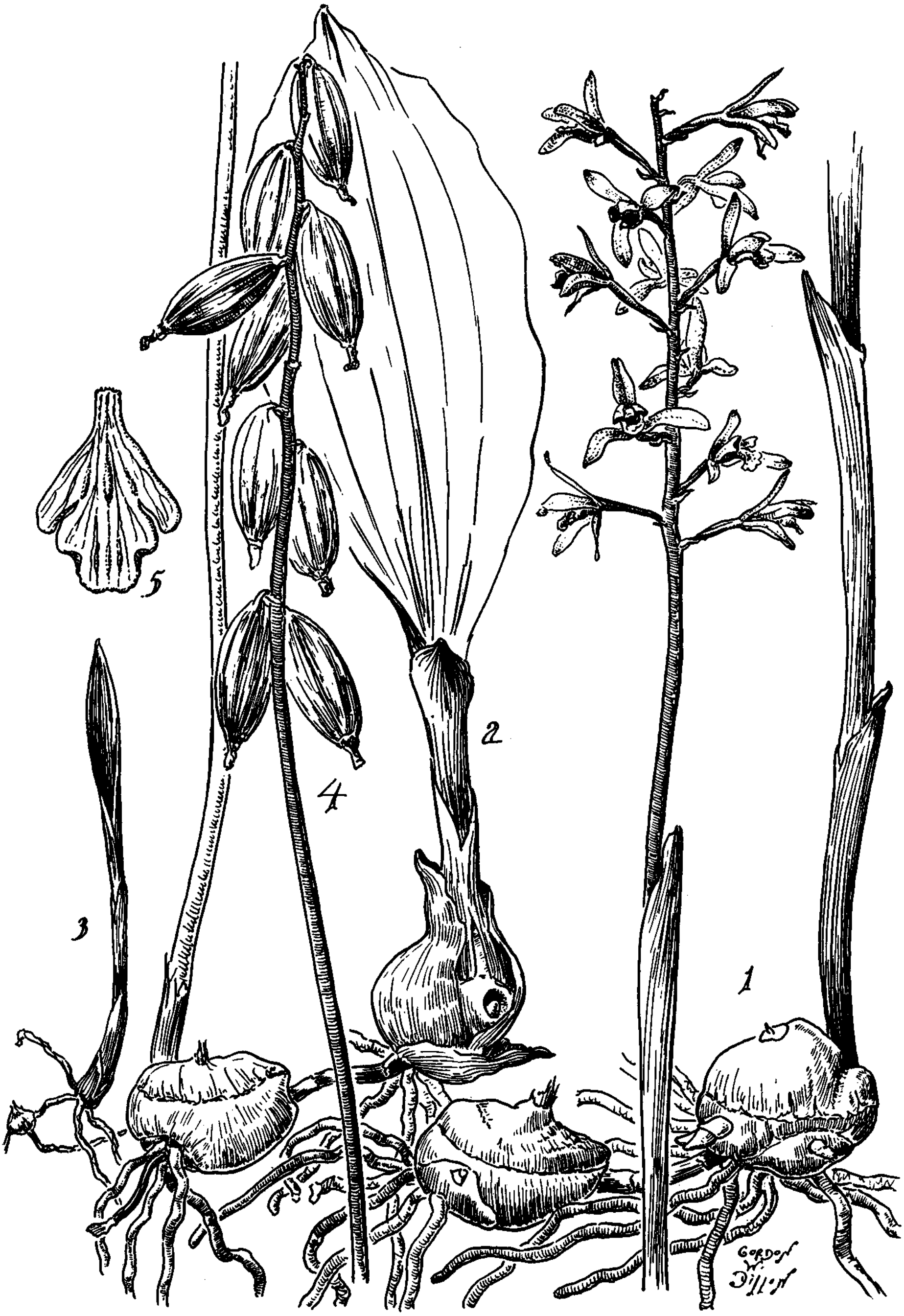
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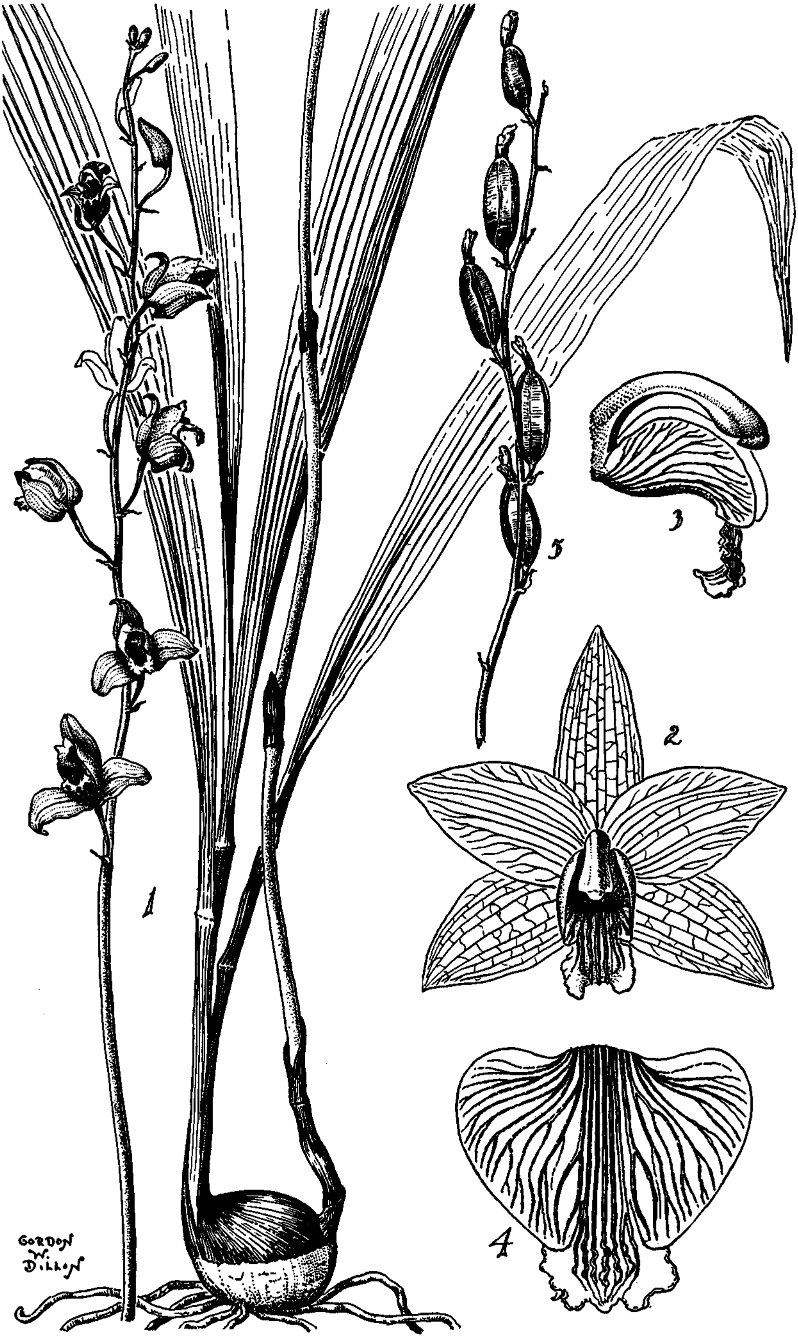
Fig. 395. **Aplectrum hyemale:** 1, flowering plant; 2, plant with leaf, winter phase; 3, leaf-shoot; 4, fruiting inflorescence; 5, lip, spread out.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GORDON W. DILLON

Fig. 396. **Bletia purpurea:** 1, plant; 2, flower, front view, spread open; 3, lip and column, side view; 4, lip, spread out; 5, fruiting inflorescence.

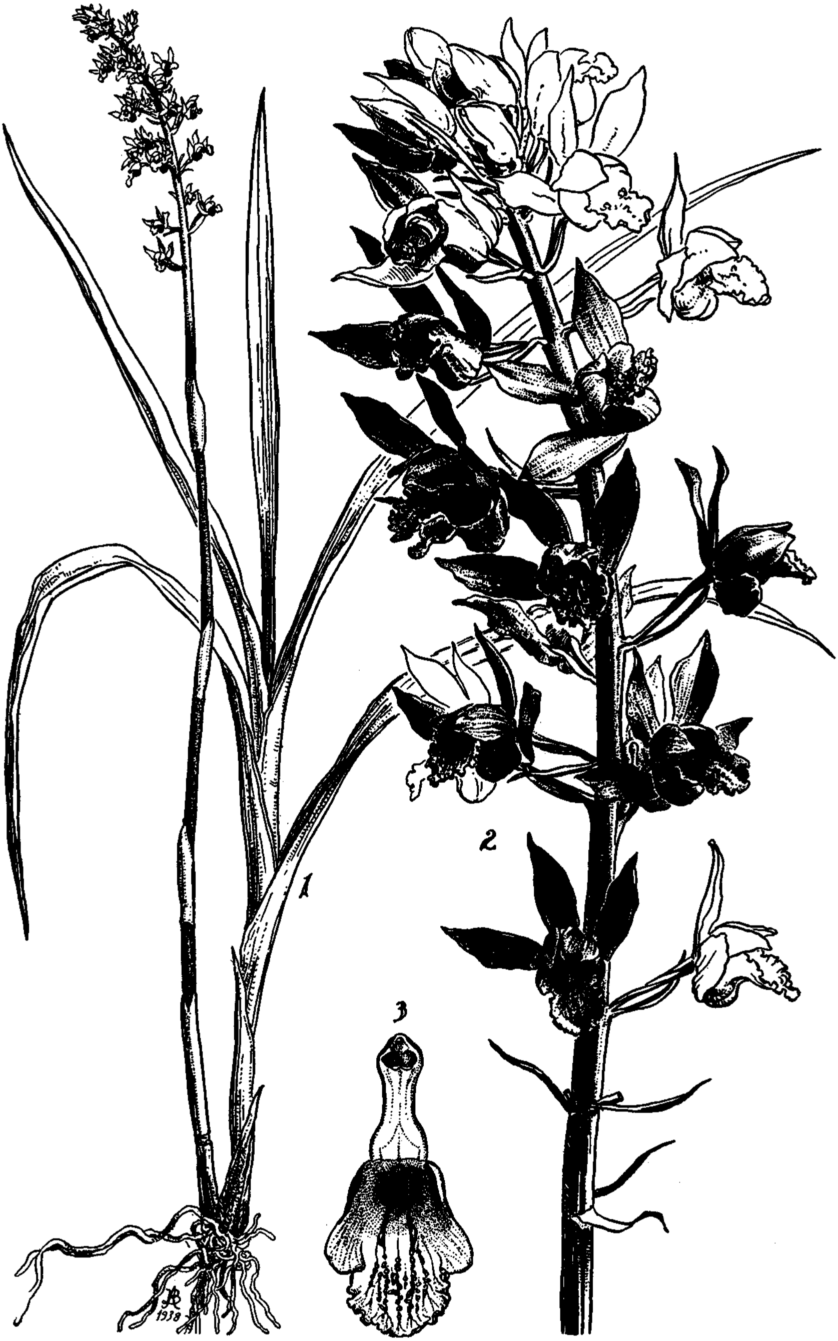

Fig. 397. **Eulophia alta:** 1, plant, greatly reduced; 2, inflorescence; 3, lip and column, front view, lip spread open.

acuminate, 2–12 dm long, 3–11 cm wide. Inflorescence a lax many-flowered lateral raceme, from near the base of the corm, up to 10.5 dm long (including the peduncle); peduncle up to 1 cm in diameter. Flowers up to 60 or more, greenish to bronze-colored with the lip marked with purple, often opposite or in whorls along the rachis, the slender arcuate pedicellate ovaries 1.5–2 cm long. Sepals elliptic-oblong to oblong-lanceolate, acute to acuminate, often slightly dilated above the middle, 1.5–2.6 cm long, 5–7.5 mm wide above the middle; dorsal sepal shorter than the lateral sepals; lateral sepals oblique, adnate to the column-foot. Petals wider than the sepals, broadly oblong-spatulate to oblanceolate, obtuse to broadly rounded at the apex, 1.5–1.8 cm long, 6–8 mm wide above the middle. Lip articulated to the column foot, 3-lobed, saccate at the base, with the terminal half strongly recurved in natural position, brownish green tinged and veined with purple, 1.8–2.5 cm long, 1.4–1.6 cm wide across the lateral lobes when spread out; lateral lobes relatively small, incurved and embracing the column in natural position, with the free part short and broadly rounded at the apex; midlobe ovate-semiorbicular, broadly rounded at the apex, with the margins undulate-crisped and somewhat erose, 8–12 mm wide; disc with 2 erect short flaplike subquadrate keels in front of the saccate basal portion, papillose-crested along the central veins of the midlobe. Column erect and somewhat arcuate, compressed, dilated below, with a broad shallow foot at the base and small lateral wings above, 7–9 mm long.

In acid humus-rich sandy soils in coastal prairies, open pinelands, banks of rivers, margin of ponds, borders of sawgrass ponds and hammocks, roadside ditches, and in hammocks. S. Fla.; W.I., s. Mex., C.Am., S.Am.; Afr.

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Glossary

Abaxial. Pertaining to the side of an organ away from the axis, such as the lower surface of a leaf.

Acaulescent. Seemingly without a stem, actually applied to a plant which has a very short or subterranean stem.

Achene (akene). A hard, dry, indehiscent, 1-seeded fruit, 1-locular.

Acicular. Needlelike.

Actinomorphic. Descriptive of a flower or set of flower parts which can be cut through the center into equal and similar parts along two or more planes; radially symmetrical.

Acuminate. Long-tapering to a pointed apex, the sides of the angle somewhat concave.

Acute. Sharply angled, the sides of the angle essentially straight.

Adaxial. Pertaining to the side of an organ toward the axis, such as the upper surface of a leaf.

Adnate. Fusion of unlike structures or parts.

Aggregate. Crowded into a cluster; a number of separate fruits from a single flower aggregated together.

Alternate. Said of leaves occurring 1 at a node; said also of members of adjacent whorls in the flower when any member of 1 whorl is in front of or behind the junction of two adjacent members of the succeeding whorl.

Alveolate. Pitted, honeycombed, as are the surfaces of some seeds or achenes.

Androecium. A collective term applied to all structures of the stamen whorl or whorls.

Androgynous. Staminate flowers above the pistillate in the same inflorescence.

Androphore. A support or column, formed by fusion of filaments, on which the stamens are borne.

Annual. A plant which completes its life history within a year.

Anther. The pollen-bearing part of the stamen.

Anthesis. The period during which a flower is open.

Antrorse. Directed forward or upward.

Apetalous. Without petals.

Apical. At the tip or summit.

Apiculate. Terminated abruptly by a small, distinct point, an apiculus or apicule.

Arachnoid. Covered with long hairs so entangled as to give a cobwebby appearance.

Arcuate. Curved, bowlike.

Aristate. Awned; provided with a bristle at the apex.

Ascending. Directed or rising upward obliquely.

Asepalous. Without sepals.

Attenuate. Gradually narrowed to a long point at apex or base.

Auricle. An earlike appendage.

Awn. A stiff, bristlelike appendage, usually at the end of a structure.

Axil. The angle found between any two organs or structures.

Axillary. In an axil.

Barbellate. Provided, usually laterally, with fine, short points or barbs.

Bayou. A creek, usually slow-moving.

Biennial. A plant requiring two years in which to complete its life cycle, the first year growing only vegetatively, the second flowering, fruiting, then dying.

Bifid. With 2 lobes or segments, as at the apices of some petals or leaves.

Bilaterally symmetrical. Said of corolla or calyx (or flower) when divisible into equal halves in one plane only; zygomorphic.

Bisexual. Pertaining to an individual flower having both male and female parts; said of a plant having all bisexual flowers.

Blade. The expanded portion of a leaf, petal, or other structure.

Bloom. The white powder, dust, or waxy covering sometimes on stems, leaves, flowers or fruits.

Bract. A reduced leaf or small leaflike structure, particularly one subtending a flower or an inflorescence branch.

Bristle. Stiff, strong but slender hair or trichome.

Bulb. A short underground stem surrounded by fleshy leaves or scales.

Caducous. Said of a part, such as a sepal or petal, that falls off quickly or early.

Calyx. The outer series of perianth parts of a flower, commonly green in color, frequently enclosing the rest of the flower in the bud stage, occasionally colored or petallike (petaloid), in some groups greatly reduced or lacking.

Calyx tube. Tube formed by wholly or partially fused sepals. Not the floral tube of an epigynous or perigynous flower.

Campanulate. Bell-shaped, usually applied to calyx or corolla.

Cancellate. Latticed, or resembling a latticed construction, usually said of a surface such as that of an achene or seed.

Capillary. Very slender, threadlike.

Capitate. Aggregated into a dense, compact cluster or head; a knoblike stigma terminating a style.

Capsule. A dry, dehiscent fruit originating from two or more fused carpels.

Carinate. Provided with a ridge or keel extending lengthwise along the middle.

Carpel. The unit of structure of the female portion of a flower.

Castaneous. Chestnut brown.

Caudex. The thickened persistent base, usually of an herbaceous perennial.

Caulescent. Having a well-developed stem above ground level.

Centrum. Central portion.

Cespitose (caespitose). Growing in tufts.

Channeled. Having a deep longitudinal groove.

Choripetalous. Corolla with petals distinct from one another.

Ciliate. With marginal hairs that form a fringe.

Clavate. Club-shaped, gradually thickened upward.

Claw. The narrowed, stalklike base of some sepals or petals.

Cleft. Cut ¼ to ½ the distance from the margin to midrib or apex to base, or generally, any deep lobe or cut.

Coherent. Having like parts united.

Collar. Outer side of grass leaf at junction of sheath and blade.

Comose. With a tuft of soft hairs, a coma.

Connivent. Approximate but not organically united.

Convoluted. Said of parts rolled or twisted together when in an undeveloped stage, as in some corollas in the bud stage.

Cordate. With a sinus and rounded lobes at the base, the overall outline usually ovate; often restricted to the base rather than to the outline of the entire organ; heart-shaped.

Coriaceous. Leathery.

Corolla. The inner, usually colored or otherwise differentiated, whorl or whorls of the perianth.

Corm. A bulblike structure in which the fleshy portion is predominately stem tissue, the covering of membranous scales.

Corymb. A racemose type of inflorescence in which the lower pedicels are successively elongate forming a more or less flat-topped inflorescence, the outer flowers opening before the inner.

Crenate. Shallowly rounded-toothed; scalloped.

Culm. A term for the aerial stem of a grass or grasslike plant.

Cuneate. Wedge-shaped, tapering toward the point of attachment.

Cuspidate. Tipped with a short, rigid point.

Cyme. A type of inflorescence in which each flower is terminal either to the main axis or to a branch.

Deciduous. Falling after completion of the normal function.

Decumbent. Reclining on the ground, with ascending distal portions.

Decurrent. Extending downward, applied usually to leaves in which the blade is apparently prolonged downward as two wings along the petiole or along the stem.

Dehiscent. Opening and shedding contents; said of stamens and fruits.

Deltoid. Triangular in outline.

Dentate. Having marginal teeth pointing outward, not forward.

Dichotomous. Forking in pairs.

Digitate. Fingered, several members arising from one point.

Dioecious. Said of a kind of plant having unisexual flowers, the male and female flowers on different individual plants.

Distal. Farthest away from the point of attachment, or origin.

Distichous. Two-ranked, on opposite sides of an axis and in the same plane.

Divaricate. Widely divergent.

Divided. Referring to the blade of an appendage when it is cut into distinct divisions to, or almost to, the midvein.

Dorsal. Pertaining to the back; the surface turned away from the axis.

Downy. Covered with short, weak hairs.

Echinate. Bearing prickles.

Elliptic. An outline that is oval, narrowed to rounded at the ends and widest at about the middle (as the outline of a football); ellipsoid, a solid with an elliptical outline.

Emarginate. Said of leaves, sepals, or petals, and other structures that are notched at the apex.

Emersed, emergent. Raised above and out of the water.

Endocarp. The inner layer of the wall of a matured ovary.

Entire. Having a margin devoid of any indentations, teeth or lobes.

Ephemeral. Referring to an organ living a very short time, usually a day or less; lasting a very short time.

Epigynous. Pertaining to a flower having sepals, petals, and stamens borne at the summit of a floral tube, the ovary being within and fused with the floral tube, the ovary thus said to be inferior.

Epipetalous. Said of stamens when they are inserted on the corolla.

Equitant. Used of conduplicate leaves which enfold each other in two ranks, as in *Iris.*

Erose. Uneven; said of margins that give the appearance of having been torn, or of margins with very small teeth of irregular shape and size.

Exocarp. The outer layer of the wall of a matured ovary.

Exserted. Extending beyond (some enclosing part).

Falcate. Curved like a sickle.

Farinaceous. Containing starch or starchlike substance; also applied to a surface with a mealy coating.

Farinose. Term applied to a surface with a mealy or scurfy coating.

Fascicle. A bundle or close cluster.

Fastigiate. Clustered, parallel erect branches.

Filament. The stalk bearing the anther.

Filiform. Threadlike, long and very slender.

Fimbriate. Cut into regular segments and appearing fringed.

Flabellate. Fan-shaped.

Floccose. Said of pubescence which gives the impression of irregular tufts of cotton or wool.

Foliaceous. Leaflike.

Follicle. A fruit developing from a single carpel and dehiscing along one suture.

Fusiform. Tapering at both ends.

Gamopetalous. Corolla with petals to some extent united. Same as sympetalous.

Gamosepalous. Calyx with sepals to some extent united. Same as synsepalous.

Geniculate. Bent abruptly at the nodes.

Gibbous. A distended, rounded swelling on one side, as on a calyx or corolla tube or segment.

Glabrate. Becoming glabrous with age.

Glabrous. Without pubescence.

Gland. A secreting part or appendage.

Glandular. Having or bearing secreting organs, glands or trichomes.

Glandular-pubescent. Hairs or trichomes capitate and secretory.

Glaucous. Having a frosted or whitish waxy bloom or powdery coating.

Glomerate. In compact groups.

Glume. A chafflike bract; specifically the one or one of two empty bracts lowermost on a grass spikelet.

Gynecandrous. Having staminate and pistillate flowers in the same spike or spikelet, the latter above the former.

Gynoecium. The pistil or pistils of a flower, taken collectively.

Gynophore. Stalk or stipe of a pistil.

Habit. Term used for the growth form of a plant.

Hastate. Arrow-shaped, with basal lobes that spread nearly or quite at right angles.

Herbage. Aboveground, nonwoody parts of plant.

Hirsute. Clothed with long, shaggy hairs, rough to the touch.

Hispid. Clothed with stiffish hairs.

Hyaline. Of thin, membranous, transparent or translucent texture.

Hypogynous. Pertaining to a flower having sepals, petals, and stamens with their point of origin below the ovary, the ovary thus said to be superior.

Imbricated. Overlapping like shingles on a roof.

Immersed. Growing under water.

Incised. Having deeply cleft margins.

Included. Not projecting beyond (an enclosing part).

Incrassate. Becoming thick or thicker, especially toward a tip or margin.

Indehiscent. Said of fruits that remain closed and do not shed their seeds.

Inflorescence. An aggregation of flowers occurring clustered together in a particular manner usually characteristic of a particular kind of plant.

Internode. The portion of a stem between nodes.

Involucre. A group of closely placed bracts that subtend or enclose an inflorescence.

Involute. Said of margins that are rolled inward (toward the adaxial side).

Keel. The folded edge or ridge of any structure.

Labiate. Lipped, as in a calyx or corolla.

Lacerate. Said of a margin torn irregularly.

Lacunate. With air spaces or chambers in the midst of tissue.

Lamellate. Made up of thin plates.

Lamina. The blade or expanded part of a leaf, petal, etc.

Lanate. Woolly, with long, intertwined, curled hairs.

Lanceolate. In outline, broadest toward the base and narrowed to the apex, several times longer than wide.

Lemma. The lower (abaxial) bract, usually one of two, subtending the flower in a grass spikelet. See palea.

Lenticular. Lens-shaped, biconvex.

Ligule. An elongate, flattened structure; in grasses, especially, the bractlike emergence from the top of the leaf sheath at the base of the blade.

Limb. The spreading part of a synsepalous calyx or sympetalous corolla; usually referring only to the calyx or corolla lobes, sometimes to their two lips.

Linear. Long and slender with parallel or nearly parallel sides.

Lip. The upper or lower part of a bilabiate calyx or corolla.

Lobulate. Divided into small lobes.

Locule. A compartment of an anther or an ovary.

Loculicidal. Said of capsules that dehisce along the back of the locule.

Marcescent. Withering but remaining persistent.

Marsh. A tract of wet land principally inhabited by emergent herbaceous vegetation.

Membranous. Having a thin, soft, pliable texture.

Mesic. Pertaining to conditions of medium moisture supply.

Monoecious. Said of a kind of plant having unisexual flowers, the male and female flowers on the same individual plant.

Mucro. A sharp, abrupt point or tip.

Muricate. Having a rough surface texture owing to small, sharp projections.

Naturalized. Of foreign origin, but established and reproducing as though native.

Node. The place upon a stem which bears one or more leaves or bracts.

Nodose. Nodular, knotty.

Oblanceolate. In outline, broadest above the middle, shortly tapered to the apex, long-tapered to the base, much longer than broad.

Oblique. Slanting; unequal-sided.

Oblong. In outline, longer than broad, the sides nearly parallel for much of their length.

Obovate. Inverted ovate.

Obsolete. Rudimentary or not evident; applied to a structure that is almost suppressed; vestigial.

Obtuse. Having a blunt or rounded end (basal or distal).

Opposite. Said of leaves or bracts occurring two at a node on opposite sides of the stem. Said of flower parts when one part occurs in front of another.

Ovate. In outline, broadest at or near the base, not greatly longer than broad (roughly the outline of an egg); ovoid, a solid with an ovate outline.

Palea. The upper (adaxial) bract, usually one of two, subtending the flower in a grass spikelet. See lemma.

Pandurate. Fiddle-shaped.

Panicle. A loose irregularly compound inflorescence with stalked flowers, i.e., the branches racemose.

Papillose. Descriptive of a surface beset with short, blunt, rounded, or cylindric projections.

Pectinate. Said of a structure which is cleft into divisions in such a way as to resemble a comb.

Pedicel. The stalk of a flower in an inflorescence.

Peduncle. The stalk of a flower borne singly or the stalk of an inflorescence.

Peltate. Said of a plane structure that is attached at a point on its surface, not attached marginally.

Perennial. Living three or more seasons.

Perfoliate. Said of opposite or whorled leaves or bracts that are united into a collarlike structure around the stem that bears them.

Perianth. The calyx and corolla taken together, or either one if one is absent.

Perigynium. The saclike structure that envelops the pistil (and eventually the fruit) in *Carex.*

Perigynous. Pertaining to a flower having the sepals, petals, and stamens borne at the summit of a floral tube, the ovary (ovaries) being within but free from the tube.

Persistent. Remaining attached after the normal function has been completed; long-continuous.

Petal. The unit of structure of the corolla.

Petaloid. Said of a floral part (not a petal) having the form of a petal, usually showy.

Petiole. The stalk of a leaf.

Pilose. Pubescence comprised of scattered long, slender, soft hairs.

Pinnate. Having a common elongate axis, with branches, lobes, veins, or leaflets arranged divergently on either side.

Pistil. The unit of female function of a flower, may be comprised of a single carpel or two or more carpels united.

Pistillate. Said of a flower bearing a pistil or pistils but not stamens; may refer also to a plant having only pistillate flowers.

Placenta. The structure or tissue within the ovary bearing the ovules.

Plano-convex. Flat on one side, convex on the other.

Plicate. Folded into plaits, usually lengthwise.

Plumose. With hairlike branches, feathery.

Pollinium. A mass of coherent pollen characteristic of orchids and milkweeds.

Polygamo-dioecious. Polygamous but chiefly dioecious.

Polygamo-monoecious. Polygamous but chiefly monoecious.

Polygamous. Having bisexual, pistillate, and staminate flowers on the same individual plant.

Polypetalous. With many distinct petals.

Procumbent. Trailing or lying flat, but not rooting.

Proliferous. Bearing supplementary structures such as buds or flowers, either in an abnormal manner or in a manner that is normal but from adventitious tissues.

Puberulent. Minutely pubescent, the hairs soft, straight, erect, scarcely visible to the unaided eye.

Pubescent. A general term for hairiness.

Punctate. With depressed dots scattered over the surface.

Pustulate hair. Hair with an enlarged base.

Raceme. An inflorescence with a single axis, the flowers stalked.

Rachilla. The axis of a spikelet in grasses and in some sedges.

Rachis. The central prolongation of the stalk (peduncle), the axis through an inflorescence, or of a leaf stalk (petiole), the axis through a compound leaf.

Radially symmetrical. Said of a flower or set of flower parts which can be cut through the center into equal and similar parts along two or more planes; actinomorphic.

Receptacle. The more or less expanded apex of a floral axis which bears the floral parts.

Remote. Separated from one another.

Reniform. Kidney-shaped.

Reticulate. Netted.

Retrorse. Having hairs or other processes turned toward the base.

Retuse. With a shallow, rounded notch at the apex.

Revolute. Said of margins that are rolled backward (toward the abaxial side).

Rhizome. A horizontal underground stem.

Rhombic. An outline like a rhomboid, a parallelogram with equal sides, having two oblique angles and two acute angles.

Rosette. A group of organs, such as leaves, clustered and crowded around a common point of attachment.

Rugose. With a wrinkled surface.

Saccate. Having a saclike swelling.

Sagittate. Shaped like an arrowhead with the basal lobes pointing downward.

Salverform. Said of a corolla in which the tube is essentially cylindrical, the lobes abruptly spreading.

Scabrous, scabrid. Rough and harsh to the touch.

Scape. A leafless (or only bracteate) flowering stem arising from below the substrate or from a very short leafy stem.

Scarious. Thin and dry, usually more or less opaque.

Scorpoid. Said of a circinnately coiled determinate inflorescence in which the flowers are two-ranked and borne alternately at the right and left.

Secund. Disposed on one side of a stem or axis.

Sepal. The unit of structure of the calyx.

Septate. Partitioned by walls.

Septicidal. Said of capsules that dehisce along the junction of their carpels opposite the septae.

Serrate. Having marginal teeth pointing forward.

Sessile. Not stalked.

Setaceous. Bristlelike.

Sheath. The basal part of a lateral organ that closely surrounds or invests the stem.

Slough. A wet place of deep mud or mire; a sluggish channel.

Spadix. A spike with a fleshy axis, the flowers more or less embedded in the axis.

Spathe. A sheathing lateral organ, usually open on one side, enclosing a flower bud, a developing inflorescence, or an inflorescence.

Spatulate. Shaped like a spatula, i.e. gradually widening distally and with a rounded tip.

Spike. An inflorescence with a single axis, the flowers sessile.

Spikelet. A small or secondary spike; the unit of structure of grass and often sedge inflorescences.

Spur. A tubular or saclike projection from a petal or sepal; also refers to a very short branch with closely spaced leaves.

Stamen. The male organ of a flower; usually consisting of a stalk or filament and an anther producing the pollen.

Staminate. Said of a flower bearing a stamen or stamens but not pistils; may refer also to a plant having only staminate flowers.

Staminodium. A sterile organ in the stamen whorl, presumed to be evolutionarily derived from a stamen.

Stigma. That part of the pistil that receives the pollen.

Stipe. The stalklike basal part of an ovary, or of a fruit such as an achene.

Stipule. Paired appendages at the base of a petiole or a leaf or on each side of its insertion, sometimes fused.

Stolon. A stem with long internodes that trails along the surface of the ground, usually rooting at the nodes.

Stramineus. Straw-colored.

Striate. Marked with fine parallel lines.

Strigose. Surface clothed with stiff, often appressed hairs, these usually pointing in one direction.

Style. The part of the pistil (if present) connecting the ovary and the stigma.

Subulate. Relatively narrow, with a long taper from base to apex.

Sulcate. Grooved.

Swale. An open hollow or depression, usually wet at least seasonally.

Swamp. A wooded area having surface water much of the time.

Tendril. A slender twining or clasping process, modified stem, leaf, or part of a leaf, by which some plants climb.

Terete. Circular in cross-section.

Testa. The outer covering of a seed.

Throat. Term applied to an expanded part of a corolla tube just below the lobes.

Thyrse. A paniclelike inflorescence consisting of a slender indeterminate main axis with lateral axes determinate, i.e., cymose.

Tomentose. Densely covered with short, matted hairs.

Trichome. Any hairlike outgrowth of the epidermis.

Trigonous. Three-angled in cross-section.

Triquetrous. Having three projecting angles.

Truncate. Cut squarely across, either at the base or apex of an organ.

Tubercle. A surficial nodule; a thickened, solid, spongy crown or cap, as on an achene.

Turbinate. Inversely conical.

Umbel. A flat or convex flower cluster in which the flower stalks arise from a common point (like the rays of an umbrella).

Unisexual. Pertaining to an individual flower having only male or only female parts, not both; a plant having unisexual flowers.

Urceolate. Urn-shaped.

Utricle. A small, thin-walled, often somewhat bladdery, 1-seeded fruit.

Verrucose. Warty.

Verticil. A ring of organs, e.g., leaves, flowers, flower parts at a given position on an axis; whorled.

Villous. Covered with fine long hairs, the hairs not matted.

Wet woodland. A wooded area having surface water some of the time, for intermittent short periods.

Zygomorphic. Said of the corolla or calyx when divisible into equal halves in one plane only; bilaterally symmetrical.

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